THE BOOK WAS DRENCHED

SKILL AND MANAGEMENT

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BY

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PREFACE

In this short book consideration of the procedures involved in making an analytical approach to problems is intended to contribute to the Study of Management, or to help to provide individual qualification for Management, itself the process and the agency through which men plan and direct the supply and distribution of goods and services. The technical problems of Management outlined in the Author's "Approach to Management" are those underlying the division of the work of supply, production, and distribution; they are concerned with human or informal relations and organisation or formal relations, with supervision; and with systems and methods applicable to work and people.

The purpose of the present book is to stress the need for recognising that to-day's methods of Management are based, or should and could be based, upon the same impartial and essentially logical principles that govern scientific reasoning and investigation. The method used in designing the book has been to study the road which scientific investigation has followed in its development from philosophy through logic to experiment and resultant knowledge.

The book does not offer even a partial substitute for the separate and detailed study of the subjects of philosophy, logic, or scientific method, but it may enable the practical man to discover, or rediscover, some of the uses of those subjects, still too often dismissed as "theoretical," with a derogatory emphasis. No originality can be claimed for this digest of knowledge which must many times have been outlined for different purposes and at far greater length in the language of almost all countries. Any value attaching to it lies in the condensation, presentation, adaptation, and application of an otherwise over-documented subject in one particular and limited field. Its reading could and should exercise the powers of logical reasoning, powers that are increasingly demanded of subordinates by the head of any flexible organisation, powers that the subordinate would do well to demand of himself, if he respects promotion by merit.

The scope of the book is limited to such parts of an infinitely wide subject as have a direct application to Administration and Management. A glance at the Bibliography on page 98 will suggest how helpful, or necessary, is the condensation and correlation of such a body of literature, especially for those with scanty leisure, who yet wish to do some serious reading and to make the most of the time that remain to them after the main work of the day is done. Its interest may well be greatest for executives and managers who have never found the opportunity to study science and method, yet are conscious of a need for some pattern into which their own first-hand experience and discovery of principles may be fitted. Its value could then be as a refresher of principles and a foundation for that co-operation which may come from the sharing of the same well-tried methods of thinking and reasoning.

The book is concerned with "subject-knowledge," or "knowledge about," with the principles and theory that underlie management, and can be applied in any enterprise, large or small. When these principles are applied they develop into a technique, or "know-how," and there may be almost as many techniques as there are applications and technicians. Each of these two forms of knowledge is necessary and each complements the other; they do not compete.

It has often been claimed that Management is itself a form of specialisation and that, in any business, quite apart from producing goods, or supplying a service, there is a distinct and specialised process, that of managing those engaged on production, supply, or distribution and the activities of each of them. In the very large enterprise this is true and in the medium-sized company it has often been true, in the past, but if this claim should be generally conceded, up goes the overall cost and down goes the importance and the level of the more general quantities required of the engineer, the accountant, and the salesman. Surely, except in the largest enterprise, this is wrong? Good management is the product of particular qualities of a particular attitude of mind, combined with knowledge of principles and methods.

Economy of manpower and of money demand the simplification of organisation in addition to the simplification of work and that means the restoration to the main activity and

the main authority of any specialisation that unnecessarily has become separated and magnified. Management seems to be a subject in which we specialize to improve our capacities, but that does not change us into a class apart. There will be no "management revolution." We all manage someone and somethings, even if that someone is oneself and the somethings our own behaviour and work. Specialisation may be the technique we use to increase skill in the subject of management, which is only a means and not an end in itself.

G. E. M.

Kenley,
September 30, 1947.

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CHAPTER I

SPECIALISATION AND ORGANISATION

CIVILISATION has emerged from the primitive, from the rudeness and ignorance of our animal ancestry through a continuing series of refinements, involving many stages in social progress; the polishing of manners and customs and the gradual discovery, development, distribution and use of economic knowledge, among other forms of knowledge. Such activities almost automatically produce among those engaged upon them something of a specialist approach to the problems which are created, whether those problems be social, artistic, emotional, economic, industrial, or commercial. The actual decision to limit his subject may emanate from the individual's desire for happiness, from an itch for possessions or knowledge; or it may represent his striving after power or his desire for personal status, but in any case it leads naturally to specialisation. Specialisation is the verbal label attached to a physical limitation of subject and mental concentration, on the part of individuals or groups of people; it is needed and employed to increase mechanical ability, motor dexterity, verbal facility, or skill, or knowledge of any one particular technical part, point of view, or limited activity, from among the several that are involved in each work process or method of operation.

Such a decision may represent a deliberate attempt by the individual to raise his own capacity and skill, *e.g.*, on the part of the youth who attends evening classes; it may alternatively follow as a natural consequence upon the organisational decision to divide up work by its separate processes. In the second case increased skill may develop involuntarily from repetitive experience, from doing the same thing often, without any conscious attempt being made by the individual to study his work or increase his knowledge. Professor Bartlett points to another cause of specialisation, that of the developmen

and growth of fatigue arising from the performance of highly skilled work. As fatigue increases, the worker tends to split up a complex job and to concentrate on one particular part, in consequence of which he forgets, neglects, or is ineffective or inefficient in doing, the other parts of the job. The investigation of the facts that led to these conclusions was directed to a study of the reactions of pilots to overstrain, the experiments being conducted in land-borne cockpits of air-trainers.

Doctors and surgeons deliberately specialise, after a thorough and complete medical training or qualification, let it be noted, and they specialise on single organs of the body—heart, brain, eye; or upon associated organs, *e.g.* ear, nose, and throat; or on a single process as in the case of the anæsthetist. All these are branches of medical or surgical treatment, but the concentration upon a particular branch, or specialism, has undoubtedly advanced the techniques of treatment and probably of diagnosis, in addition to the increase it has effected in knowledge of the subject itself. It is perhaps important to note that doctors qualify in " subject knowledge " before they specialise, that they have to be fully educated in their subject, before they concentrate upon the " know-how " of any one aspect of it. There is at present no such qualification required before administrative or managerial specialisation and as a result their specialists have been known to pull in many different directions at the same time.

Musicians specialise on particular instruments or the works of individual composers; equally, but in a different way, mechanics, engineers, architects, and shopkeepers specialise; in fact all who work on any complicated subject divide up that subject, concentrating upon one particular application, branch, field, process, or phase, whether for convenience, interest, or perfection of skill. The tendency to employ all one's powers on a limited division of work has resulted in making the specialist almost a target for amusement, on the ground that he increasingly knows more and more about less and less. This particular extreme loses its point when the specialist goes to the length of specialising upon and splitting " that body too small to be divided "—the atom. Despite this diversion, we, either as individuals or collectively, turn to the specialist for his help in research, or when frightened,

or when we are in trouble; whenever in fact we are in need of the best advice on, for example, a legal position or when we are anxious to know the cause of a pain.

It might well be claimed that men specialise to aid the development of civilisation, in the sense of the perfection of economic and social knowledge, but this claim might be difficult to substantiate where any advance in knowledge of morals or ethics is concerned; it could alternatively be stated that men are forced to specialise by the gradual development of civilisation itself.

Emile Durkheim says that the time has passed when the perfect man was he who appeared interested in everything without attaching himself exclusively to anything, capable of tasting and understanding everything, finding means to unite and condense in himself all that was most exquisite in civilisation. This general culture, formerly lavishly praised, now appears to us as a loose and flabby discipline. We disapprove of those men whose unique care is to organise and develop all their faculties (but without making any definite use of them) and without sacrificing any of them, as if each man were sufficient unto himself, and constituted an independent world. It seems to us that this state of detachment and indetermination has something anti-social about it. The praiseworthy man of former times is only a dilettante to us. To agree with Durkheim is not difficult.

As a result of the specialist tendency, whatever may have given rise to it, the work men do, in a large enterprise, reflects the lines on which they specialise in the manner in which their work duties and working relations are arranged for them and divided. Within any well-organised enterprise the nature and degree of the specialisation followed by the staff governs the form that the organisation will take.

That form, of organisation, has to be deliberately thought out and laid down by the executive, who, as a direct consequence, will be closely preoccupied with the co-ordination, or the inter-relation, of specialist activities. Further consideration will be given to this essential phase of organisation work in Chapter VI.

In the field of social development it has been claimed that the more specialised are the functions of society, the greater is

the potential capacity for progress. This is almost certainly an overstatement, but it affords some indication of the importance of the specialist in the more general field.

It is perhaps obvious that all organised or subdivided work, as distinguished from that of the one-man unit, passes through certain essential phases or processes that are broadly the same in all forms of enterprise.

(i) Planning and maintaining the business (general management);

(ii) Providing the right tools, material, staff (supply);

(iii) Processing and perfecting the product or service (production);

(iv) Selling and delivering the goods (distribution);

(v) Paying bills, collecting debts, making records of what has been done and how much it has cost (accounting);

(vi) Keeping all helpers interested in the business, and its progress, and improving their conditions of work and of service (staff relations).

Technically, in the language of organisation, these work processes are called functions, a word used to signify the major activities or groupings of work by which an enterprise divides its operations. This business connotation of the word "function" is not unlike the meaning attributed to it by some sociologists, where the word is used in two quite different senses. Sometimes to denote a system of vital movements, without reference to their consequences; at others to express the relation existing between these movements and corresponding needs of the organism. In this sense sociologists speak of the "function" of digestion, or of respiration, and also that digestion has "as its function" the incorporation into the organism of liquid or other substances.

The scientific or medical meanings attributed to the word "function" are important for the specialised slant they give to an important business aspect that is often overlooked. The word "vital" added to "function" conveys the difference between "any activity" and a "function." The bodily senses, thus, are not functions, for the body may continue to

live without them, however impaired the mental powers may become through the loss of the senses. The organs associated with the adjectives "vital" and "functional" are those without which life would soon cease—lungs, heart, stomach, brain. If this scientific meaning be carried into the subject of organisation, which has innumerable activities but few functions of the vital sort, it seems to afford a more helpful idea of the uses and abuses of "organisation by functions" than is the case when the meaning is undefined, or taken as being synonymous with "activity." It is perhaps only common sense, or knowledge of principles, that demands careful and repeated consideration of the basis of the groupings by which we divide work; consideration that will classify activities into those that are vital, or primary, and others that are secondary, paying the greatest attention to the vital organs or organisms, grouping the secondaries together in subordination to the primaries they are designed to serve. Co-ordination is made very difficult when "activities" and "functions," "secondaries" and "primaries," are confused one with the other in a basic and "functional" division of work. This subject is again considered on page 84.

All six essential business functions are clearly recognisable in manufacturing industry and equally are present, although less easily recognised, in the professions and in the home. They divide either naturally, or to suit the particular needs of individual enterprises, into a number of "sub-functions," or processes, some of which, because of their importance or prominence to an individual enterprise, are rightly promoted to the level of a major function.

Thus the design process would be treated as a function in any industry closely affected by fashion, or other rapidly changing requirement, whereas basically it represents the first stage, or a preliminary stage, in manufacturing. In some industries the work of buying raw materials or goods is a major function and in others it is only a process in the production function. When this promotion, from process to function, occurs, as it is certain to occur, to meet the special requirements of an enterprise, problems of direction and co-ordination almost immediately arise, due to the removal of authority and responsibility from one vital, essential, or parent function over,

and for, the performance of some " daughter " duties that are naturally part of its direct interest and authority.

Whereas Distribution is a major function it is clear that in many companies its activities have to be divided into a number of parts, such as :

Market research,
Customer relations,
Competition,
Agencies or channels of distribution.

Product development,
Pricing and terms of sale.

Transport,
Depot management.

Sales direction,
Sales control,
Sales management (staff),
Sales co-ordination.

Advertising,
Sales promotion aids.

Sales accounting,
Credits and accounts collection.

Each of these parts will again be divided and subdivided into a number of interests, that will vary trade by trade and product by product, but they may, each of them, in the large company, need to be separately manned. The interrelation of all these activities is an essential of management, not merely necessary to the maintenance of the authority of the executive but equally of primary importance to the co-ordination and operation of the function.

Where any subsidiary process becomes magnified so that it usurps the authority of the major function, the loss of executive

control over all the processes, or some of them, must detract from that function's technical authority. This qualification of the word authority suggests specialised meanings for that word. Technical authority is but one of several differing kinds of authority, all of which express power in some shape or form, latent or operational, and all of which are important in organisation.

First, is that impersonal authority represented by the terms of reference for a particular enquiry or duty, a Statute or a Regulation, the written instructions upon which one is to work, even the statement of one's objective. Associated with the word, in this sense, is some symbolisation, in writing, or by badge, or seal, needed to carry conviction. This form of authority derives from above, from the head of the enterprise, or in his own case from the body that gave him his appointment. We might call it "*Statutory Authority.*"

Second, is the personal authority that is an expression and delegation of power; power to give instructions; the authority itself is expressed in the form of rank, or other insignia. Thus a man taking command of a number of colleagues, of rank equal to his own, may need a step in promotion to give him formal authority. In other applications of the same sense, power is represented by an impersonal authority; the Tennessee Valley Authority, or a Local Authority—these are both examples of a major delegation of power and of authority amounting to a partial or complete abdication of sovereignty on the part of the central administration. This "*Formal Authority*" also is bestowed from above.

Third, is a "*Technical Authority*" that consists of recognition on the part of those governed, or associated, of the possession by one individual of a particular skill, ability, or knowledge *that can be respected as relatively perfect.* Thus a person may be recognised as an authority on Patent Law, or on the cutting speeds of metals, or on the drama, or on particular works of art. Such authority is bestowed voluntarily upon an individual, independent of his position. It gives personal power but is not in any sense a delegation of power.

Fourth, is an "*Authority of Leadership,*" personal to one man. It is not quite the same as technical authority, for it is

seldom explicit; it depends upon a belief, on the part of those who bestow it, in the possession by the leader of various qualities of character and honesty of purpose, in addition to technical or administrative ability, or both. It is not necessarily associated with rank, or position, but it voluntarily bestows the right to issue commands, and it does this as among equals or from below, but the authority of leadership cannot be bestowed from above.

In executive management it may be argued that some of the six essential, or primary, or direct functions are not in fact separate functions, but may be processes used also by the other functions; it may be claimed that in fact "general management" and "staff relations" are not separable as functions in that they enter into the execution of all work, functionalised or not. These are the arguments that similarly lead to a considerable diversity of opinion and practice in organisation and in the structural way in which individual enterprises divide up their duties and responsibilities; a diversity that offers a fruitful field for the expert adviser or organisation consultant.

[In this context *Duty* is the action or behaviour, or a series of obligations, owing to a higher authority in return for employment, appointment, or office. Where the individual is independent his duty can be self-imposed. *Responsibility* is the acceptance, even if reluctantly, on the part of the individual of a liability to carry out the duty and to report upon action taken. (If a man takes responsibility he assumes authority.) *Irresponsibility*, however caused, is a failure to realise, or carry through to a conclusion, the full duties with which a person is charged directly, or that indirectly he may owe to the community, or another, in return for some benefit.]

Whenever specialisation of human ability and effort exists, some corresponding form of functionalisation, of splitting the work into its functions, becomes necessary to permit the specialists to operate in their limited spheres. The alternative would be to demand of every employee knowledge not only of all the technical subjects involved in an undertaking, but also of the management functions that are concerned with the conduct or governing of the whole enterprise; which is clearly absurd, and in any large unit is beyond the individual powers, or outside

the range of attention, of most of us. It is possible that in some finite fields, where knowledge is measurable and relatively absolute, specialisation could be but a temporary phase of social, governmental, and industrial organisation; in such cases it would be used, almost as a lever is used, to raise the levels of technical knowledge, but could be discarded if or when that knowledge has been developed and made available for general use.

One of the effects of specialisation is that all of us who are technically or functionally expert, *i.e.*, trained in a limited field, seem to develop a narrow outlook, whereas what is socially and organisationally needed, in general management and in administration, is the overall view of the " total situation," that comprehends internal and external policies, or, in the individual case, that sees all round the problem, the work requirement, the effects upon staff and upon society. In support of this opinion, it has been found that specialisation, if left to itself, has been known to lead to a monopoly of knowledge that in itself can be socially dangerous. It is administratively dangerous when the specialist hides himself behind a technical façade and takes a special pride in the mysteries of his particular job, or of his self-made empirical art. Such a pride often leads to the over-development on the part of the specialist of a highly sensitive defence-mechanism, showing itself as a resentment against intrusion, or criticism, and is responsible for much of the warring of experts, an organisational situation that has to be observed to be believed. This is no new problem of organisation. Ure drew attention to it some eighty years ago, remarking that by the infirmity of human nature it happens that the more skilful the workman, the more self-willed and intractable he is apt to become, and, of course, the less fit a component of a mechanical system. This same trait has also been called " the insolence of skill," a label that very aptly describes one of the disadvantages of specialisation. It is often caused by the indignity imposed on the skilled man of supervision by officials or managers who are technically unqualified, partially or completely uninformed and are sometimes insufficiently interested in the technical details or necessities of operation. Like all other forms of " insolence," it has been found to respond to intelligent direction and tech-

nical understanding, but is increased by uninformed or arbitrary direction.

Elton Mayo points out that skills, although transmissible to other persons, are only slowly so transmitted, and are never truly articulate; knowledge derived from experience is hard to transmit, except by example, imitation, and trial and error, whereas erudition (" knowledge-about," or perhaps " subject-knowledge ") is easily put into symbols—words, graphs, maps. The suggestion left in the mind is that the " insolence of skill " is not necessarily all " insolence," but may rather be a direct effect, or one of the compensating weaknesses, of the skill itself, in that it is so difficult of transfer and so often personal in quality. Whereas the acquisition of a skill does not necessarily mean any immediate or corresponding limitation in some other faculty, it is observable that great ability is often accompanied by an eccentricity, and lesser skills in the same way by mental kinks.

Another effect of the specialisation of industrial functions is the invariable conflict that it produces between privately owned capital and labour. Durkheim attributes this conflict to the historical separation, at home and at work, between masters (managers) and workers and to the consequent inability of either to understand the other. Various sociologists have discussed this difficulty, pointing to its absence in the small and sometimes the rural enterprise where these physical distances do not exist. We have no evidence yet to show whether or not the same conflict, or " failure to communicate," will be present when capital is state-owned, but if it is truly caused by the remoteness of managements, by reason of their specialisation, then, in due course, similar conflict should appear, whatever form ownership may take.

In a different field the profession of medicine has indicated the need for more general, or all-round, consultants to maintain the balanced view between possibly conflicting specialised views—"to decide when doctors disagree "—or perhaps to anticipate and prevent possible disagreement. Perhaps it should be pointed out that all doctors are specialists—in the subject of health—and are equally liable to limitation of overall vision, to miss consideration of the whole picture, the national need.

Similarly in the administration of government, or industry, the reconciliation of conflicting technical demands presents a very real problem, yet a problem that has been brilliantly solved in individual cases of private ownership and can almost certainly be so solved again, whenever and wherever men put their minds to it.

If specialisation is one of the techniques of science it would seem reasonable to expect that the scientific outlook should be recognised among specialists, the outlook that lays its findings open to enquiry and, apart from the essential requirements of a competitive system, has little use for secrecy of process. Professor Ryle has enumerated certain ethical ideals which constitute the discipline of the scientist, ideals that might with advantage be applied by all specialists. These are, he says, "*intellectual integrity and freedom, the absolute necessity for veracity and precision, the sharing of new knowledge, the obligation to publish important findings, the recognition of priority where priority is due.*" Morality, or the observance of ethical standards, is possibly implicit in this scientific discipline, or it may be a concomitant, even though the precise basis of discovery and knowledge condemn tradition as a basis for conviction.

The case for the existence of the specialist has been made, whether we individually appreciate his need or not, for every technical and professional worker specialises in some degree. It now remains to determine whether, in his specialisation, he follows any particular course of action, or common course of study, or mental training, to fit him for this work.

There must be innumerable and often different fields of operation or research in which the specialist will be working, yet it appears reasonable that the method each will follow, in whatever technical field of operation, will be substantially the same. The process of research, or the application of scientific method, is a common factor to all forms of specialisation. Reasoning, which is part of the research process, was summed up by John Locke as: "The discovery and finding out of proofs; the regular and methodical disposition of them, and laying them in a clear and fit order, to make their connection and force be plainly and easily perceived; the perceiving their connection; making the right conclusion." To turn Reason into Research there must be added, or perhaps interposed,

between the third and fourth of Loeke's stages, an additional part, that of experiment, testing, or sampling.

In a number of professions the preliminary approach to a case consists of a careful examination of the facts of a given situation and the consideration of the implications of those facts in the light of a particular field of knowledge, and these preliminaries make use of a number of the same physical and thinking processes, processes that in combination are elaborated into a technique, or mechanical skill, sometimes described alternatively as an Analytical Attitude, a Rational Approach, or a Scientific Approach. Such a skill is required by the Sciences, by the Law and increasingly although spasmodically in the Administration and Management of Public and Private Enterprise.

CHAPTER II

SPECIALISATION AND MANAGEMENT

THE problems of business management are usually approached under one of two different terms of reference—authoritative or advisory. In the first, or executive, case a decision has usually to be given detailing what has to be done; in the second, suggestions are required of alternative methods for doing the job, with or without recommendation of the one particular method considered by the investigator to be the most suitable, economical, or convenient method to be followed in the particular circumstances of the case. Investigations of this kind are more often involved in large-scale enterprise than in small units where the problems are often informal and individual, soluble by thought or intuition, where all the facts of the case may already be available in the brain and experience of the sole administrator. *Intuition* is in such cases the association of the individual's past experience with the facts of the present problem and the combination, or the integration of experience and acts, in the form of a decision. The dictionary calls intuition "the immediate apprehension of the mind without reasoning." It may be remembered that Descartes gives a different meaning, more nearly the clear vision of the intellect that leads to knowledge, and consequently he attributes powers to intuitive reasoning that are not claimed by some other philosophers, powers that permit of influence by religious or other inspiration.

Memory can play a large part in what are generally accepted as intuitive decisions, for it will impartially store either reasoned experience, or, alternatively, the conviction, based on experience, that represents a person's settled belief in the validity of his deduction, irrespective of his ability to recall the proof that justified the conviction. A man of wide experience, or a practical man of quick sense, may often solve problems intuitively, but, when the undertaking is large, or the problems are highly complicated, involving factors that are foreign to

past experience, then intuition often gives way to sheer straight guessing. In the small enterprise, where most decisions come within the personal experience of the man who has to decide, intuition or " hunches," based on self-evidence, remain in use and are often successful. The complete mastery of the detail of a question gives to a man not only thoroughness but a rapidity of argument or answer that men call brilliant thinking, although it is in reality the provision and use of first-class information.

In the large undertaking, intuitive thought constitutes a danger to successful operation, for, in all major decisions affecting important interests, it is necessary to get rid of ready-made, and snap judgments, and to enjoy an impersonal, detached freedom of mind. The preferred alternative to intuition is the reasoned or rational approach to work problems, where a factual investigation is made and a balanced judgment is formed. Whereas we do not know how to teach people to be intuitive, we do know within broad limits how the young, at least, can be taught to be rational.

Giddings claimed that *the scientific study of any subject is the substitution of business-like ways of " making sure " about it, for the lazy habit of making irresponsible assertions about it. To make sure, it is necessary to have done with a careless " looking into it," and to undertake precise observations, many times repeated. It is necessary to make measurements and accountings, to substitute realistic thinking for wishful or fanciful thinking and to carry on a systematic " checking up." The process of science is essentially one of getting at facts and trying to understand them.*

Such a rational approach has both direct and indirect values; direct in that the problem is carefully investigated and usually correctly solved; indirect for the effect that the use of a reasoned approach produces upon the investigator, from the emphasis that reasoning and science place upon the need for complete objectivity and impartiality in judgment; for an insistence upon the making of detailed plans, programmes, accurate measurements and specifications; for special abilities that are developed through carrying out the methodical processes essential to analysis, investigation, and experiment. All these personal qualities that develop from following this

reasoned approach would seem to have increasing importance for those engaged in any professional or technical work and particularly wherever specialisation and functional limitation of the field of work tend to obscure, or even paralyse, the specialist's capacity for the overall view, or a completely rational judgment.

Specialisation and its corollary, organisation by function, could then be expected to contribute to the general overall effectiveness of operation at the same time as they make managerial efficiency more difficult to maintain because of their divergencies of activity.

If an objective has been agreed upon and achieved then the enterprise may claim to have been effective, to have done what it set out to do, no matter what the cost turned out to be. You can thus be effective at high cost—inefficient, which is the measure, in money, material, or man hours, of the cost of your achievement, yet effective. The well-managed enterprise sets out to be both effective and efficient.

Effectiveness of performance cannot be expected to survive loss of managerial efficiency for very long, and the third step in the sequence, whose first is specialisation and second is organisation by function, is therefore the improvement of management by the close co-ordination of specialisations.

An illustration of the effect upon the individual of working within a narrow field is expressed by a remark often made by leading industrialists, that "there is plenty of room at the top." The inference to be drawn from this statement is that specialisation has been responsible for training men to be technical rather than to be administrative, confirmed perhaps by the policy under which some large enterprises have found it necessary to embark upon a process of grooming selected executives for stardom, because they find that they cannot rely on experience by itself to give the administrative qualities that they need. An alternative to such grooming, or an aid to its further success, might well be the extended use of a series of ladders of promotion designed to build up a planned background of experience, qualitative in addition to being quantitative; not leaving a good man so long in any technical or functional job that he develops the corresponding limited outlook; providing him with opportunities to regain his per-

spective through change of specialisation or general management duties, and work that will develop special abilities for investigation and thought. The Report on "University Education and Business," dated 1945, said that Administration needs minds competent both to appraise the human factors in a situation and quick to appreciate the possibilities of technical innovation. Its leading positions more and more must be filled by men whose minds, by habit and training, are strategic rather than tactical, who are accustomed to verify ideas and opinions by a study of facts and results, and to take long-term rather than short-term views of costs and advantages. This same Report, the Spens Report, from which this quotation is made, challenged the fundamental snobbery running through the whole social system which tends to regard those who deal with organisation and finance as superior to those who deal with research and production (although the latter are technically qualified), consequently making co-ordination and collaboration difficult of achievement between activities that are essentially complementary.

In 1918 the Haldane Committee on the Machinery of Government made a recommendation that could be read as a plea for the greater use of realistic thinking in the approach to administrative work.

"FORMULATION OF POLICY

"12. Turning next to the formulation of policy, we have come to the conclusion after surveying what came before us, that in the sphere of civil government the duty of investigation and thought, as preliminary to action, might with great advantage be more definitely recognised. It appears to us that adequate provision has not been made in the past for the organised acquisition of facts and information, and for the systematic application of thought as preliminary to the settlement of policy and its subsequent administration."

Compare also Washington's instruction to the Executive:

"In all important matters deliberate maturely, but execute promptly and vigorously and do not put things off until to-morrow which can be done and require to be done

to-day. Without an adherence to these rules business will never be done, but will always be in arrears."

These quotations will emphasise the importance of thinking and reasoning as subjects and as two of the methodical processes on which discussion will be offered.

Somewhat naturally, specialisation differs in form and appearance according to whether work is of managing (involving thought) or of performance (demanding the carrying out of a routine). What is the process by which men specialise? It is by concentration upon one single aspect of a subject, by investigation of fact, by thought and reasoning, but in manual, or repetitive work, clerical or mechanical work, specialisation usually means standardisation and the performance of a simple standardised operation over and over again. This thought raises the spectre of a mechanical world where work tends to become so simplified, as a result of specialisation and its consequent, standardisation, that many operations and whole jobs will make no demand upon the operator for the employment of any thinking powers.

At a first glance the future of those engaged upon this work appears retrogressive. Tocqueville is quoted by Durkheim as saying—" the art progresses but the artisan retrogresses "—yet further reflection may suggest that many operatives actually prefer to engage in work which will permit of their reserving their mental powers for purely personal and private use. This seems most noticeable in mass-production factories where high wages and a sociable group life, working and conversing in parties on a conveyor belt, appear to some workers to be preferable to the performance of more mentally exacting work. This seems to have been noticed in the earlier days of factories and Ure said—although perhaps his reason for so saying was rather to offer a sedative than to proclaim a scientific discovery —that " the operative needs to call his faculties only into agreeable exercise; he is seldom harassed with anxiety or fatigue, and may find many leisure moments for either amusement or meditation without detriment to his master's interests or his own."

Investigators of the Industrial Health Research Board have reported upon the tendency to " reserve one's powers," in the

course of their investigations in factories and offices. Dr. May Smith writes of an educated type: "A highly intelligent person who likes routine work because, while it may be boring, it is not exhausting." If such an attitude is to be encouraged because of increasing mechanisation, labour-saving machinery will have to be genuinely used to save the labour of the operatives and not primarily to save money by discharging operators. If hours of work are progressively shortened, but only as output is increased, by means of more efficient machinery (*technical efficiency*), improved management (*managerial efficiency*) and the fundamental, *individual efficiency*, without which the others are useless; if output is thus maintained and increased, and there is undoubtedly room for increase, then a manual job in a factory could consist of intensive work, under good conditions, for a few hours a day only, leaving ample time for leisure and perhaps intelligent occupations in self-chosen surroundings. Reduction in hours must be geared to increase in output. This presupposes that operators want to work and do work; that there are good relations between employer and employee and suitable incentives to work. This may be a gratuitous supposition, for there is no substitute for the non-financial incentive, no royal road, no formula, nor any talisman that will always establish good relations.

Such a book as this must necessarily be concerned with work of a non-repetitive character, work that calls in greater or less degree for processes of thought, reasoning, and understanding (based upon experience), and for the application of some, if not all, of these mental activities to the beliefs, theories, situations and facts that arise in the day-to-day conduct of business. Thought and reasoning demand of their practitioners the possession and use of certain qualities and methodical processes. These have been studied and developed in association with the work of scientific research, work that is based upon factual investigation preparatory to experiment or controlled observation; in this field, the practice involved in reasoning has been recorded in sufficient detail and for a sufficient period of time to permit the recognition of the essential processes to be followed. Locke's description of the processes of thought, published in 1689, is still interesting.

" When the mind turns its view inwards upon itself and contemplates its own actions, thinking is the first (mode) that occurs. In it the mind observes a great variety of modifications, and from thence receives distinct ideas. Thus the perception which actually accompanies and is annexed to any impression on the body made by an external object, being distinct from all other modifications of thinking, furnishes the mind with a distinct idea which we call '*sensation*'; which is as it were, the actual entrance of an idea into the understanding by the senses. The same idea, when it again recurs without the operation of the like object on the external sensory, is '*remembrance*'; if it be sought after by the mind, and with pain and endeavour found, and brought again in view, it is '*recollection*'; if it be held there long under attentive consideration, it is '*contemplation*'; when ideas float in our mind without any reflection or regard of the understanding, it is that which the French call '*reverie*'; our language has scarce a name for it; when the ideas that offer themselves (for whilst we are awake there will always be a train of ideas succeeding one another in our minds) are taken notice of, and, as it were, registered in the memory, it is '*attention*'; when the mind with great earnestness, and of choice, fixes its view on any idea, considers it on all sides, and will not be called off by the ordinary solicitation of other ideas, it is that we call 'intention' or '*study*.'"

Dimnet writes :

" The names of mental operations which are now abstract were not so originally. To *see* and to *know* are the same word in Greek, to *ponder*, which sounds so intellectual, obviously means to weigh, to *think* is the ghost-like descendant of a much rougher word, meaning to seem; *logic* and *speech* are the same word; so in fine—as if to protest against too much intellectual pride—are *idea* and *image*."

Ever since the motion camera came into general use those wishing to examine a series of rapid interconnected movements, together making up a skilled operation, have used the projector in slow motion to enable the eye to follow each small subsidiary

turn or twist of the operator's fingers, movements that are indistinguishable at normal speeds of work. In this way it has become possible to teach new operators to employ the actual motions that have been proved to be the most effective and the least spendthrift of energy. There is no obvious link between motion study and thought study, other than the slowing up of a process to permit examination of a motion in detail, a mechanical slowing up with the projector, a natural leisurely process when studied in a child.

It is possible that in childhood we are all, or nearly all, blessed with a capacity to think or reason on lines similar to those that the philosophers have documented and developed, but at a slower speed. Those who have been privileged to study children will have watched them go, hesitantly, through the various processes of observation to the satisfaction of the curiosity that leads to knowledge or experience. They will have noticed a child discover and finger a strange object, question any grown-up who may be available as to the purpose of the object and pause for reflection on what he has observed, or been told, in an endeavour to relate both to what he already knows, finally storing up his new experience, or fragment of knowledge in his memory. This is very much like the complete process of thinking; substituting a childlike faith in the wisdom, or experience of others for the personal experience and assured knowledge that still have to be built up to form the standard against which new facts, new thoughts, are compared, as a preliminary to their acceptance, classification, and labelling by name. The leisurely approach of a child to thought illustrates some of the processes employed in careful reasoning, but it serves also to point to the false step necessarily made in any investigation where the investigator has to rely on outside opinion, or the equivalent of any " grown-up " who happens to be around to serve as a child's guide to knowledge. Psychologists have remarked that many people seem so have built the whole edifice of their personal knowledge on non-logical foundations picked up from a variety of sources in childhood. The superstitions and traditions of a parent, or of a class, have in this way been allowed to cloud thinking and perpetuate prejudice. The *Children's Encyclopædia* is no substitute for a mother, but it can be a very present aid in trouble and its

answers discourage prejudice. Writing on this same subject Locke said that " doctrines that have been derived from no better original than the superstition of a nurse, or the authority of an old woman, may, by length of time and consent of neighbours, grow up to the dignity of principles in religion or morality. For such who are careful (as they call it) to principle children well, instil into the unwary, and as yet unprejudiced, understanding (for white paper receives any characters) those doctrines they would have them retain and profess. These —being taught them as soon as they have any apprehension, and still as they grow up confirmed to them, either by the open profession or tacit consent of all they have to do with; or at least by those of whose wisdom they have an opinion, who never suffer those propositions to be mentioned but as the basis and foundation on which they build their religion and manners—come, by these means, to have the reputation of unquestionable, self-evident and innate truths."

J. T. MacCurdy comes to this same conclusion in his recent book on the structure of morale. Professor Ritchie writes of " unconscious metaphysics inherited from our forbears or worked out in extreme youth." " Sentiments are such an intimate part of our mental equipment," says Roethlisberger, " that often we cannot make them explicit. They act in our thinking as a system of absolute truths. For this reason they enter into the determination of our everyday judgments and thoughts. They constitute our ultimate values and significance in terms of which we assess our everyday world."

How difficult it must then be for any one of us to be completely impartial in our judgment, if we base our reasoning upon conviction, or experience translated, or transcribed, in terms of sentiment or doctrine? How necessary it must be to discover and find out proofs as the alternative to reliance upon such personal settled beliefs as we may have picked up from unrecorded and possibly unqualified sources.

Returning to the slow-motion picture of the child and his reasoning, it may be possible to see how the admirable, if slow and trustful, approach deteriorates, for children grow up into ourselves, and we become ruled by the clock, and tend to cut short, or to cut out, some of the essential processes of reflective thinking. Later, as adults, we may have to recapture

what we have lost, may read books on " thinking," secure for ourselves the leisure required for reflection, augment the battery of questions that earlier, when we were children, served as keys to open other people's knowledge, and interpret our wider accumulation of facts by analysis, investigation, and experiment. Kipling has immortalised the questionising attitude in four lines :

> " I kept six honest serving men ;
> They taught me all I know,
> Their names are WHAT and WHY and WHEN,
> And HOW and WHERE and WHO."

The pursuit of knowledge is rooted in Philosophy and naturally represents a very early if not the earliest subject of human enquiry. Plato (427–347 B.C.) defined a philosopher as one who gets inside things and discovers the nature of their reality, and he contrasts his philosopher with those who are content with mere appearances and with ready-made opinion. Two distinct avenues to knowledge are recognisable, the abstract approach through philosophy and the experimental approach through science.

The need to prove theories and apply them to practical ends has led also to a mechanical approach that provides an alternative to philosophy in the minds of those who admire the concrete form almost to the point of discounting the abstract idea. The measurable successful achievements of the practical man in a machine age tend to obscure the immeasurable value of ideas and ideals and in consequence they enhance the importance of schedules, plans, and programmes with their insistence upon detail, that are invaluable as means ; dangerous as ends.

The philosophic approach came first, apparently some 1500 years in advance of the experimental approach to knowledge. Philosophers brought the machinery of reasoning to bear on the formation and shaping of ideas towards conclusions ; scientists, insistent upon fact, subjected their hypotheses, or findings, to the acid test of experiment and proof ; both schools made use of the same thought processes, of analysis and synthesis, essential alike in the debating room and the laboratory. The achievements of the sciences in the physical field must of necessity overshadow those of philosophy in the

metaphysical, but the tendency in war and peace for scientists to be misused and for science to be debased from constructive purposes to destructive, or solely commercial ends, suggests to the philosopher that scientists, or those who employ them, could with advantage re-discover philosophy—to the end that the fruits of science may develop and ripen in a form that may more nearly coincide with the tastes, interests, and requirements of human society. Sir Henry Dale, in an address to the scientists of twenty-five countries delivered in Philadelphia in 1946, offers an alternative in a suggestion that universities might bind themselves never to accept contracts for research, either from the State or industry, except under conditions ensuring complete freedom to make known the results to all the world.

There are two, perhaps necessarily different, bodies or faculties of scientific knowledge that help to mould a decision, that expression of judgment which in itself should represent the application and action of reasoning upon facts discovered by the process of research. Under the powerful light of these two forms of knowledge the facts are examined and the inferences that arise from their consideration are assessed. Just as craftsmanship guides a tool to excellence, that in other hands may give but a poor job, so the one branch of science concerned with " subject knowledge " should guide the other branch, " know-how." Subject knowledge should embody within scientific knowledge the ethical, equitable, and economical requirements of human society, and it should guide action so that it will conform with the principles and rules laid down by each branch of scientific knowledge. Descartes left this avenue of thought open when he attributed to intuitive thinking " the clear vision of the intellect," a vision that might be inspired, or might alternatively need to integrate the separate demands of knowledge. Figuratively this process might be represented as the working of a committee, co-ordinating and integrating the requirements of the situation, requirements that are based upon ethics, equity, economics, and methodical enquiry, and shaped in terms of practical experience and scientific knowledge. For too many years interest has centred upon " know-how " and in consequence our technical knowledge in any field is ahead of our " subject-knowledge " and power is one-sided and out of balance. Education has

much leeway to make up to ride level with job or vocational training.

In the less technical field of administration and management, it could be suggested that the methods, systems, and objects of some managements, and particularly of management specialists, are also in need of close association, and if possible of actual integration with the essential human requirements, physical and moral, of employees and customers.

Any suspicion of the scientist, as an agent of destruction, should be dispelled by the extension of scientific interest from the laboratory to social problems, an interest expressed by the President of the British Association for the Advancement of Science, Sir Richard Gregory, in his address for 1946, who measured the advance of civilisation by " the proportion of the community who participate in the general welfare and appreciate the opportunities provided for their physical comfort and intellectual culture." He continued, " In the fine arts the imaginative qualities of the mind appeal primarily to the emotions through stimulation of the æsthetic judgment, with feeling rather than reason as the standard of value; material culture is the province of the mechanical arts; and science—the domain of reason—is systematic and formulated knowledge in all fields of human understanding—natural, moral, social, and political. The history of civilisation from this point of view is a history of intellectual development in which science has been the chief factor in changing habits of thought from superficial observation and speculative and anthropomorphic theories of causation to clear concepts, rational conclusions and progressive principles in the advancement of man and society."

Success in research work depends upon several qualities—imagination, resourcefulness, and initiative, coupled with scientific interest and a scientific training. Some men are best fitted for long-range fundamental work, others for applying its results and solving immediate difficulties.

The succeeding chapters will discuss the " clear concepts, rational conclusions, and progressive principles " mentioned by Sir Richard Gregory, in so far as it is possible to develop on paper what must essentially remain a purely mental process that is acquired but gradually from following a strict mental discipline.

CHAPTER III

THE SPECIALIST METHOD

Investigation

The procedure necessary to the carrying out of a particular enquiry may be one of reasoning alone, in the case of an abstract problem, alternatively it could involve research including experiment, which equally will employ reasoning at one or more stages; in either event the examination of the circumstances of the case, to give some preliminary understanding of the nature of the problem, and the collection of the relative facts, prior to the formation of conclusions, may with advantage follow certain definite and methodical lines. The procedure needed to comply with this method may be set out in the form of a number of distinct steps that have each to be traversed, preferably in the order in which they will be stated, if a self-discipline is to be observed and the researcher is to be satisfied that his investigation is thorough and complete, or as complete as may statistically be necessary. This qualification of the degree of completeness is helpful to indicate the valuable assistance that the laws of probability, and the statistician together, can give in limiting the extent of the experiment, or of the samples to be taken, to the smallest number that may statistically be sufficient to prove a point. It introduces at this point a particular use for a comparatively new profession, that of the statistician, who can be invaluable as an adviser, particularly when 100 per cent. returns, or records of operations, are suspected of being redundant to the requirements of the control that they serve.

In the hope of disarming criticism it should be pointed out that an agreed procedure, or methodology, consisting of a number of systematic steps that make up an investigation, need not imply any regimentation of thought, nor indeed of action; rather will it consist of a planned direction of the creative

faculties of each individual investigator upon proved lines. The essential differences between the fields of research, that cover the whole expanse of human understanding, will alone guarantee a sufficient variety of work for those who fear any loss of initiative through employing the same method as do others. Although the steps or processes of investigation may be distinct when written down preparatory to work, yet it is not essential that in practice they should be taken one at a time; and there will certainly be fields for research work where the approach is purely experimental when it will not always be necessary to have a working hypothesis. Any methodology will include a number of points and processes that have to be observed, the omission of any one of which may nullify the value of much careful work of investigation.

It has been stated that there are four main types of problem to be met in research work. They are as follows :

(*a*) *the historical ;* the writing of history demands such research, as does the examination of records for legal or scientific precedents, prior to their connection in the form of a report;

(*b*) *the experimental ;* this may be pure research in a laboratory or a test room, chemical, biological, mechanical, etc.; painstaking discovery as a preliminary to thought;

(*c*) *the survey of existing practices ;* such research problems are well exemplified in work studies, based upon motion studies, simplification of process, and the determination of a new procedure;

(*d*) *the synthetic ;* where pure reason, or the drawing board, is used to crack a problem open, or in astronomy where experiment is impractical.

It has also been stated that the methodology in each field, specialised though it may be in detail of procedure, will, nevertheless, be substantially the same. While this may be self-evident, as a proposition it too can be subjected to reasoning in order to determine the processes that each of these research methods demands.

(*a*) The historical method consists	of	fact finding and reasoning and conclusion.
(*b*) The experimental or speculative consists	"	experiment and reasoning and conclusion.
(*c*) The survey and improvement of existing practices consists	"	fact finding and reasoning and experiment and conclusion.
(*d*) The synthetic method consists	"	reasoning and experiment and conclusion.

If this analysis should be correct, and it would seem to be so, it will follow that the broad procedure that satisfies the requirements of (*c*) will satisfy also the demands of (*a*), (*b*) and (*d*), the whole being greater than its part, and it is therefore proposed to concentrate upon (*c*), the investigation that surveys and improves upon existing practices.

The steps followed in such investigation are listed to emphasise each stage through which the investigator will have to pass in determining what the problem may be. It must be remembered that the terms of reference originally formulated for an investigation have very often to be reconsidered in the light of the further knowledge obtained during the first stages of the research; and also, in working out the solution to the problem as it eventually presents itself. It is a little different from the usual list, in that it goes only into such detail as is required for management investigations, and, further, that it schedules an actual stage for the reconsideration of the whole problem prior to the formation of any preliminary ideas as to the solution. This pause for study of the objective emphasises the imperative need for impartiality and the avoidance of guesswork, or the " recognising " of the problem itself, or its solution, because of some association, or resemblance, between the appearance or facts of the case with some apparently similar previous experience of the investigator.

This same pause, organisationally, marks the point in time for observers, investigators, and statisticians to come together with the technical or operational staff, whenever a large and specialised team is at work upon a major investigation. It is

the first point in the proceedings at which detailed experience and knowledge of the technical subjects of the field under investigation *must* be introduced to enable the purely impartial, completely detached observer, to relate his discoveries to their implication and so interpret their meaning. Up to this point, the qualities demanded of the observer, whether working in a team or individually, could with advantage specifically omit previous experience of identical or similar problems and rely upon a trained ability to recognise and record the relevant facts. This need, to separate the two identities of observer and theorist, would seem to have some importance also for the investigator working alone. His quality of impartiality is needed to forestall any tendency to intuitive thinking or guesswork; or to prevent his own previous experience from clouding his clarity of fair judgment. Such a mental separation will nearly always be imperfect, where one man doubles both parts, because an investigator can seldom remain coldly scientific, particularly in human situations, but we shall return to other aspects of the observer-theorist relationship later (see page 37).

The stages of investigation are as follows :

(1) The delineation and delimitation of the problem (after the survey of the field);

(2) The collection of facts in homogeneous form and the rejection of irrelevancies; the consideration of other research in the same field; the compilation of a bibliography;

(3) The classification, sorting and arranging of data, direct and indirect;

(4) The analysis, interpretation, and co-ordination of the data;

(5) Reconsideration of the problem;

- (*a*) the formation of preliminary ideas;
- (*b*) observation, selection and isolation of the factors;
- (*c*) experiment by variation of the circumstances;
- (*d*) determination of the cause.

(6) Reasoning to conclusion and verifying;

(7) Presentation of the conclusions.

Descartes published his "Discourse on Method" early in the seventeenth century, but the advice he gave is most relevant to the conduct of such a procedure as has been outlined.

> "(1) Never to accept anything for true that I did not clearly know to be such; carefully to avoid precipitancy and prejudice, and to comprise nothing more in my judgment than was presented to my mind so clearly and distinctly as to exclude all ground of doubt.
>
> (2) To divide each of the difficulties under examination into as many parts as possible, and as might be necessary for its adequate solution.
>
> (3) To conduct my thoughts in such order that by commencing with objects the simplest and easiest to know, I might ascend little by little, and, as it were, step by step, to the knowledge of the more complex; assigning in thought a certain order even to those objects which in their own nature do not stand in a relation of antecedence and sequence.
>
> (4) In every case to make enumerations so complete and reviews so general that I might be assured that nothing was omitted."

Before discussing each investigational step in turn, some definition of certain words and terms, used in a special sense, may help consideration of methods of investigation; explanation may also be needed of the choice of the quotations from authors long dead. The explanation would be that age mellows knowledge, and may serve to place the subject with which this small book is concerned in a true perspective, and supply a matured and established background of method that will be applicable in all fields where truth and accuracy are needed. There is surely nothing new in the subject of organisation, or in the process of specialisation; it is only in their application or techniques that there is novelty.

Aristotle (384–322 B.C.), the pupil of Plato, taught the first essential of science to be the collection of facts, their classification, the bringing of particular facts under general heads, and the co-ordination of facts into theories. It would appear that methods of investigation have not changed overmuch, if at all, but the subsequent stage that translates theory into

principles or laws, or alternatively discards theory, is a comparatively recent addition.

Herschel twenty centuries later both praised and criticised Greek philosophy :

> " Among the Greek philosophers we are struck with the remarkable contrast between their powers of acute and subtle disputation, their extraordinary success in abstract reasoning, and their intimate familiarity with subjects purely intellectual, on the one hand; and on the other, with their loose and careless consideration of external nature, their grossly illogical deductions of principles of sweeping generality from few and ill-observed facts, in some cases; and their reckless assumption of abstract principles having no foundation but in their own imagination, in others. . . ."

Taking the definitions a little further, Descartes, in his Discourse on Method, said that the word philosophy signifies the study of wisdom, and that by wisdòm is to be understood not merely prudence in the management of affairs, but a perfect knowledge of all that man can know, as well for the conduct of his life as for the preservation of his health and the discovery of all the arts, and that knowledge to subserve these ends must necessarily be deduced from first causes; so that in order to study the acquisition of it (which is properly called philosophising) we must commence with the investigation of those first causes which are called " Principles."

Returning to Aristotle's teaching, it could be useful to explore the quality of his raw material, " facts," as a necessary preliminary to working with them.

Facts are either objective, external to the mind and real, or subjective, where the existence of the fact is in the mind. As commonly understood, and as the data obtained by investigation to form a basis for reasoning, facts relate to the objective world, to " real " phenomena existing externally; they may, on the other hand, refer also to mental facts—to knowledge, positive or negative; to moral facts that consist of different rules of action recognisable, observable, describable, classifiable; they may be past—*i.e.*, historical facts—or present facts. Management investigations will, however, be concerned, almost solely,

with objective fact, with occurrences, expenditures, instances, and will avoid any confusion with opinion.

The fact of a table is perhaps its existence and presence in a room, yet we cannot completely dissociate the fact from the image or idea, from our awareness of the particular table, and the inference or conclusion by means of which we may deduce that it is made of wood and has solid legs and a flat top. The legs appear to be solid, yet they may be hollow, and will almost certainly contain air cells—anyway the physicist (the technical man needed to help the observer to relate his discoveries to their implication) has reached his own conclusions as to its structure.

We, as observers, infer and sense a number of qualities and superimpose them upon the fact, whenever we enter into any description or image of it. Analysis shows that the statement of the simplest fact involves an inextricable blending of inference, or quality derived from sensation; this is more than suggested by an alternative definition of a fact; " a bundle of inferences (or assumptions) tied together by one or more sensations." [*Note.*—Fact, according to John Dewey, is, speaking physically, the ultimate residue after human purposes, desires, emotions, ideas and ideals have been systematically excluded. A " social fact " on the other hand is a concretion in external form of precisely these human factors, and without a system of social purposes " social " facts remain a miscellaneous pile of meaningless items.]

Science progresses by the application of ideas to facts, in the pursuit of new knowledge. A fact by itself has no merit, except the historical merit that the phenomenon once existed. There is no progress made, nothing is achieved by the mere statement of a fact, until some person employs the process of reasoning to the inferences arising from it. A fact is, then, sound material for thought.

Mannheim, whose loss is still felt by us, has something to contribute on this point; he says:

> " the theorist considers that from the standpoint of genuine empiricism the greater accuracy obtained by a meticulous attention to detail is outweighed by the loss of perspective, the failure to see the wood for the trees. Once a single

branch of knowledge is studied in isolation it becomes unreal, and paradoxical as it may sound, the only person who is acting realistically is the theorist, who pieces these fragmentary observations together to form a coherent scheme. The stronger his theoretical powers are, the clearer his realisation that the only perceptions worthy of the name of reality are those which have passed the stage of survey and statistical researches and are able to interpret events in all their different aspects as fragments of a complete social order, the outlines of which can be drawn through carefully stated inference. Economic theorists are used to working with hypothetical models of thought in which deductive reasoning plays a great rôle. This very often makes them think that a higher scientific dignity is attached to such thought processes, whereas everyone knows that these deductions are no better implements for grasping reality than any other tool which does justice to the special sphere of reality with which it has to deal. Owing to the contemporary mania for what are called facts, we are apt to forget that an age can only learn to know itself if the different methods of approach, the powers of formulation, and the analysis of complex phenomena, do not lag behind the collection of data. It is not enough that our age should be rich in a knowledge of fundamental facts, which give it ample scope for new experiences; it must also frame its questions adequately. This it can only do if the tradition of theoretical formulation is held in the same esteem as the technique of sheer fact finding. It is clear that this period of mere fact finding has lasted long enough. We must try to create a period of theoretical integration that must be carried out with the same sense of responsibility which the specialists always feel in approaching their particular problems." [*Note.*—Mannheim's " theorist " is the man with the vision of the " total situation," the ideal top executive.]

The processes of reasoning—different ways of thinking—themselves make an interesting study. Locke defines *sensation* as " the simple operation of external objects through the senses," which might alternatively and additionally be rendered " the conscious impression of objects upon the mind." He

describes *reflection* as " the internal sense by which the mind observes its own operations," and *contemplation* as " the holding of an idea under attentive consideration." Most emphatically he warns us against *jargon*—" the learned but frivolous use of uncouth, affected or unintelligent terms, vague and insignificant forms of speech and abuse of language, that are but the covers of ignorance and hindrance of true knowledge." He warns us to use no words but such as we make the signs of certain determined objects of the mind in thinking, which we can make known to another; to use the same word steadily for the sign of the same immediate object of the mind in thinking; to join these words together in propositions according to grammatical rules and to unite these sentences in a coherent discourse. Locke points out that to make words serviceable to the end of the communication of thought it is necessary that they excite in the hearer exactly the same idea they stand for in the mind of the speaker. Without this men fill one another's heads with noise and sounds, but convey not thereby their thoughts and lay not before one another their ideas.

What is the signification of the word *idea*? The dictionary suggests a pattern of thought, a conception, a plan of things to be aimed at, a mental target, a scheme of action, a way of thinking, the immediate object of thought or mental perception. There would seem to be a variety of meanings, but the sense in which it is to be used in this context is of " our awareness, and conception of, external things."

It may be interesting to list the impressions and processes of thought that may result from an observation:

(i) A table (existence, a fact).

(ii) A sensation of its form (by looking at it, or by touch).

(iii) Images or ideas are formed about the table and related one to another in a single conception that may lead to definition, developing into abstractions (the stripping of an idea from its concrete accompaniments) and generalisations about tables.

(iv) Reflection follows on what has been observed; and comparison is made between the observer's previous ideas of what other tables look like, or should look like, and the

present idea about the existing table, thus combining the rôles of " observer " and " discoverer."

(v) As resultants of these processes, inferences are made regarding the material composing the table, its weight, strength, durability, appearance, etc. : these mental reactions to the sensations and reflections of the observer are necessarily conditioned by his own mind and experience.

(vi) The inferences made are combined in a theory, or explanation of the fact—*i.e.*, recognition of the principles underlying the existence of the fact.

Theory is, then, a supposition explaining something ; especially is it associated with a supposition based upon principles independent of the phenomenon (in the example of the table, the principles might well be those of dynamics, of the strength of the support needed to carry an agreed weight, and so on).

In this particular example of a chain of thought, or sequence of ideas, consideration has been limited to the fact itself, to its nature, and to explanation of what it essentially is. The next link in the chain would be to establish the cause underlying its existence or appearance.

The researcher, having collected and arranged his facts, has now to formulate a *hypothesis* to bind the facts together. A hypothesis is but one conception or idea among many alternative possible conceptions or ideas, never to be thought of as if it were a real fact, but regarded as an intelligent guess, or a starting point for investigation, subject always to rejection and discard, if it proves to be fallacious or inadequate. It is the statement of a supposition, or it is a proposition, which has yet to be proved, but it must be capable of proof, if it is to have application to the research method. If a proposition, or a hypothesis, is rejected, it ceases to exist; if it is proved, it endures, it is useful, and may establish a principle or explain a fact.

A *principle* is a guide to action, or to understanding, and may be established as valid by test, or by consistent observation. *If it is truly a principle, it will almost certainly, when enunciated, be acclaimed as " common-sense."* It is submitted that to be possessed of common-sense is to be armed, consciously or uncon-

sciously, with a knowledge of principles and an ability to think and speak in terms of principles.

There is some confusion in people's thoughts between " private " and " personal " principles, that are rules governing behaviour, and are often based upon the doctrine upon which as children we were fed, and the other " scientific " or " logical " principles used in research and reasoning. It will be helpful to a consideration of this subject if the second meaning only is used.

There are two recognised methods of reasoning employed in research work, the methods of induction, and of deduction. They are alternative methods, and a particular investigator may on occasion prefer the inductive to the deductive method, or vice versa. The two methods are complementary, to be suited to the circumstances and conditions of the case or problem under investigation. Schluter sums up their meaning as follows :

> " *Induction* is a process (of reasoning) which begins with observed facts or collected data that suggest inferences, leading to the framing of ideas, to the association of related ideas in conceptions, and finally the defining of those conceptions, the drawing from them (of) conclusions—abstractions and generalisations. *Deduction* on the other hand is the reverse process, beginning as it does with hypotheses —that is, tentative conclusions or generalisations, and working back to possible supporting data for tests or verification of the originally posited idea."

Westaway, on the other hand, has a slightly different meaning :

> " Broadly speaking, we may distinguish between them by saying that deduction includes all reasoning in which, from given particulars, we draw a conclusion *supposed to be contained in their meaning*, while induction includes all reasoning in which we reach a conclusion from observation of facts. Induction is therefore the interpretation of facts, while deduction is the interpretation of sentences (opinions ?) assumed to be true."

The *Oxford Dictionary* defines *deduction* as "inference from general to particular," and *induction* as the "inferring of general law from particular instances."

There is nothing strictly incompatible between Schluter, Westaway, and the Dictionary: after studying what each has to say, the investigator may well feel that on occasion he may build his argument on conclusions, piling fact upon fact (induction), and on another occasion he may have no facts, and may have to probe the unknown or the partially known with hypotheses (deduction). There remains Westaway's point that the probing be guided by some content of meaning of the general condition, by some appropriateness of the hypothesis, within which attempt is being made to elucidate the particular case.

It may be helpful to utter a warning against the dangers of unverified hypotheses. The scientific worker knows well the facility with which some people make deductions, leap to conclusions, instead of methodically collecting and integrating the relevant facts and formulating them into verifiable hypotheses. He is acquainted with others who make hasty and ill-defined generalisations and speculate wildly from general and superficial experiment or observations, instead of formulating their propositions after careful search, and upon verified fact; and he will have suffered also from those who take the first answer or solution that suggests itself to them, who take action without adequate previous reflection, so impatient are they to get something upon which they think they may rely, where wisdom would counsel inaction.

To give further general confirmation for the detailed procedure of making an investigation, reference may be made to Bacon (1561–1626) who offered good advice on the observation and collection of facts as the preliminary to inductive reasoning; his fame rests in part on his pioneer work in demanding facts at first hand:

> "Our first object must be to prepare a history of all the phenomena to be explained. The history is to include both observations and experiments; it ought to be composed with great care; the facts accurately related and distinctly arranged; their authenticity diligently examined; those

that rest on doubtful evidence, though not rejected, yet noted as uncertain, with the grounds of the judgment so formed."

Bacon throughout distinguishes between fact and theory. Whewell (1794–1866) points out that when a real discovery is to be made, the separation of the observer from the theorist is not possible, the questioning temper and the busy suggestive mind being needed at every step to direct the operating hand or the " open gaze " (the observing eye). Mere observers cannot supersede the discoverer who is to introduce into the facts a new principle of order, though it is true that persons of moderate philosophical powers may, when duly educated, make observations which may be used by more competent discoverers than themselves.

Whewell's dictum fits the theory that, in making an investigation, there are distinct, separable phases of work, requiring, on the part of investigators, different classes of knowledge and experience with which to supply the intellectual background against which specialised, and if necessary differing, techniques can operate.

Thus the first phase is one of general survey or reconnaissance, whose background, or " subject knowledge," is that of the strategic observer, whose technique is that of research and investigation. (There is clearly a marked difference between the work of reconnaissance and that of detailed investigation, the same difference as lies between broad policy and technical plan, between administration and supervision. The abilities might be differentiated very simply, as breadth of vision, or ability to " globalise " proportionately, plus observation, as opposed to the alternative requirement of powers of concentration on a specialised limited field, combined with an aptitude for investigation and an infinite capacity for taking pains.)

The second phase is of observation and fact collection and this phase could be mechanised, and in some fields, where facts are standard, actually is mechanised, or routinised, to the extent of hack work, needing little background and, as technique, methodical collector instinct (similar to that manifested in many hobbies). It is understood that some mass-observation techniques in the field are based upon fact collection alone,

recording the immediate reaction to the question posed, without allowing time for "rationalising"; * observation and interpretation, being highly technical work, are reserved to headquarters.

Whewell's point is good, that in most genuine research, and in all management investigations, the observer would be the better for having a good head, not as good perhaps as that of his "discoverer," but he would need to have been educated up to think and reason, to understand the subject of his investigation, to know a lot about the topic and use of the survey, in addition to having been trained in "know-how," in his methodical technique of examining, checking, and collecting facts.

The remaining phases of making an investigation—those of classification, analysis, reasoning, synthesis—demand the "discoverer" background and the research worker's technique.

To the student of management, and the man of considerable practical managerial experience, it may seem that facts and theories are realms apart, that facts are all important while in contradistinction opinions or theories are but the vapourings of the long-haired intellectual. It must be clear, however, that the collector of facts, unless he is content in his state of hack-dom, must himself be capable of thinking and reasoning about the implications of his facts, must be capable of forming theories, or explanations, about the facts collected, or he will not succeed in evaluating them. Thus it would seem essential to divorce fact-finding and theory as objects, having each their own "know-how," to concentrate upon each separately and in turn, and to re-unite them in the intelligent observer as subjects.

The evaluation of fact leads to a process involving a primary ability that lies in taking a decision promptly, an ability which is as highly appreciated by subordinates as by superiors, yet is sometimes hard to come by. Chester Barnard says the making of decisions, as everyone knows from personal experience, is a burdensome task. Offsetting the exhilaration that may result from correct and successful decision and the relief that follows

* Bertrand Russell defines rationalising as "the process of inventing what seem to ourselves rational grounds for a decision or opinion that is in fact quite irrational."

the termination of a struggle to determine issues is the depression that comes from failure, or error of decision, and the frustration which ensues from uncertainty. Accordingly, it will be observed that men generally try to avoid making decisions, beyond a limited degree when they are rather uncritical responses to conditions. The capacity of most men to make decisions is quite narrow, although it is a capacity that may be considerably developed by training and especially by experience. The discoverer has not only to observe, collect, think, and reason, but he must be able and perhaps trained to make decisions and abide by them.

Finally, let it be said that the measure of whether an investigation is, or is not, sound or scientific will be that it will give the same result when made again by an independent, impartial investigator.

CHAPTER IV

THE SPECIALIST METHOD (*Cont.*)

ANALYSIS—CLASSIFICATION—GENERALISATION

Analysis.

Westaway quotes a saying that progress in scientific investigation depends much more on the severe and discriminating judgment which enables us to separate ideas that nature or habit has closely combined than on acuteness of reasoning or fertility of invention. Whenever two subjects are intimately interconnected in the mind, it requires the most determined effort to conduct any process of reasoning relating to one of the subjects alone. In the same way, two phenomena may become associated together by chance, or accident, at or about the same point of time (in different experiments or in a natural state of development) so that they tend to appear closely connected. The cause or accident of their association, by simultaneous appearance, tends to be soon forgotten, but they may remain linked together in imagination, although the connection may be illusory. Westaway goes on to suggest that similar accidental connections, whether by reason of simultaneity, or other chance association, are responsible for such popular superstitions as those underlying the "sciences or arts" of: "palmistry," "phrenology," "planetary influences," "haunted houses"—and he utters a warning that quite able investigators have been misled by accidental combinations.

Dewey, on the other hand, attributes the existence of any superstition to a corresponding failure to make scientific inferences, an explanation that endorses the conception, put forward in an earlier chapter, that reliance, when thinking, is too often placed upon certain beliefs, faiths, doctrines, or privately owned personal principles of belief or behaviour that were picked up in childhood; these are essentially non-logical, and may in fact have been based upon the whimsical reply of a bored elder to the persistent flow of questioning of an over-

curious child; an example perhaps of purposeless or over-analysis. The association of ideas may in this sense be accidental of appearance or of tradition.

Organisation Analysis is concerned with persons and relationships, variable quantities that result in this subject bearing a resemblance closer to an art than to a science. There will be at least two sets of factors contributing to any phenomenon in which human beings are involved; first, the factors that are concerned with the phenomenon or situation itself, that may be responsive to scientific laws and may be measurable and therefore readily subject to controls; second, there will also be the variable responses of human beings to a diversity of conditions of work, circumstances of reward, and of individual circumstances including health, apart from the question of inherent capacities that vary person by person. ("Organisation analysis" is also the title given to American Government efficiency surveys designed to discover duplications, trace neglect to assume responsibilities by examining each activity or duty in detail, listing each individual position or appointment and against each post stating every responsibility incurred. Its purpose is to fix responsibility and if possible to ensure a flow of responsibility, or a chain of duties; it is not the same as a work study.)

It is by reason of its concern with human variables that management is in such small measure scientific. The methods of management, the techniques of costing, budgeting, accounting, and control that rely upon measuring, estimating, and recording, are almost scientific, but organisation and management are subjects of a different order. Their analysis has seldom been attempted. It was more cynically simple, or perhaps just more simple, to increase the reward, to dangle a financial incentive or alternatively to remove it altogether in favour of that non-financial incentive, fear. Management relations should, however, continue to afford scope for scientific but sympathetic investigation and analysis, as the technical knowledge of human behaviour and motives forms and crystallises.

Analysis has two main applications, physical and mental.

Physical Analysis may be described as the resolution of a compound subject into simple elements, for the purpose of

comparing parts or the whole, with one another or with a standard. It has been claimed that the act of analysis is very simple, but that success in making a sound analysis is dependent on wide experience of the actual dissection of subjects—*i.e.*, the resolution of a complex subject into its elements, parts, or factors. Thus there must first be experience in the process of making analyses and, second, a sound technical knowledge of the particular subject being analysed.

Analysis of financial or accounting expenditure is comparatively simple; it consists of a scrutiny of each item of expenditure; followed by a correct allocation to one or other of the various heads of expenditure; heads that have been previously agreed as being appropriate to the classification of the outgoings of the particular undertaking, or necessary to the control of its development.

Business Analysis is described (by Maze and Glover) as ". . . the determination of the fundamental elements or factors, their nature, characteristics and quantity, the careful study of these factors and their correlation."[1] In this sense, analysis would appear to comprehend a number of associated subjects which are so grouped for the particular convenience of business.

By derivation, analysis is physically concerned with loosening or unbinding, or resolving into the elements, antecedents, causes, factors, or other constituents, or component parts.

Mental or Intellectual Analyses are said, by Dewey, to differ from physical analyses, because every judgment made by the mind is analytic, in so far as it involves discernment, discrimination, marking off the trivial from the important, the irrelevant from what points to a conclusion; or the judgment is synthetic, in so far as it leaves the mind with an inclusive situation or a framework within which selected facts are placed. Thinking, first analytically and then synthetically, keeping one's thoughts within agreed limits or boundaries of reason, or experience, while governing thought according to certain proved principles, rules or laws, also scientifically determined, is perhaps an alternative way of expressing Dewey's dictum. In the application of judgment analysis, as with business or financial analysis, it would appear that the subjects or processes analysed, of accounts, of business or of judgment, have in each case been associated and linked with the analytical process itself.

Essentially analysis remains an " unbinding," employed as a tool of thought, or alternatively in the physical separation of a product or process into components, in the factory production sense of Andrew Ure, who wrote of " decomposing a process into its constituents."

An example is afforded by Herschel's analysis of the phenomena of sound from which it follows that in all cases sound transmission has these points in common :

" (1) The excitement of a ' motion ' in the sending body.

(2) The communication of this motion to the air or other medium which is interposed between the sounding body and our ears.

(3) The propagation of such motion from particle to particle of such medium in due succession.

(4) Its communication, from the particles of the medium adjacent to the ear, to the ear itself.

(5) Its conveyance in the ear by a certain mechanism to the auditory nerve.

(6) The excitement of ' sensation '."

As analysis proceeds, a point is eventually reached where the result appears to constitute an ultimate fact, after which it becomes the subject of a separate study.

It is not thought that there can be any rigid theory or practice of analysis, but Kipling's six serving men—WHAT, WHY, WHEN, HOW, WHERE, and WHO—are the tools of analysis, the spanners that will loosen difficult nuts. Ralph Barnes formulates six questions on the analysis of work methods, questions applicable in many fields of enquiry.

(1) WHAT is done ? What is the purpose of the question ?

(2) WHY is the work done ? What would happen if it were not done ? Is every part of the job necessary ?

(3) WHO does the work ? Who could do it better ? Can change be made to permit a person with less skill and training to do the work ?

(4) WHERE is the work done? Could it be done somewhere else more economically?

(5) WHEN is the work done? Would it be better to do it at some other time?

(6) HOW is the work done?

[This suggests a careful analysis and the application of the principles of motion economy. The Management of Work is, however, part of the subject of the companion volume.]

In all investigations it is to be expected that the two distinct phases will appear: (1) Physical Analysis, or the actual taking of an existing thing to pieces and (2) Mental Analysis, which is the process of thinking in the presence or framework of rules and facts, to determine their meaning as a basis for the making of inferences and theories that logically arise from them.

The object of analysis is to aid classification through the separation of a process or product into its constituent elements in order that the various elements may be sorted and made available in a homogeneous form. Classification of things made up of various parts, of composite or heterogeneous elements, diverse in character, would be more difficult. It is clear that over-analysis, or analysis for analysis' sake, like the splitting of hairs, is a waste of time on the part of the analyst and of patience on the part of the reader. The happy medium is expressed in one word "relevancy." Analysis must reduce the problem to a chain of related and relevant components or factors. The difficulty lies in remaining relevant to subject and object, and in separating facts from beliefs.

Westaway concludes his treatise on analysis with a warning:

"Unfortunately, no general rules of procedure can be laid down for the analysis of a complex phenomenon into simple ones. Success comes from experience, patience, insight and a careful study of the work of successful investigators."

Classification.

It is of the essence of the analytical approach and a necessary preliminary to clear thinking that order be observed and

developed throughout an investigation, not only in the methods employed, but also in the systematic arrangement and storage of the facts discovered.

Preparatory to storage or use, facts must be arranged in classes. One must avoid the implications of general names, examine and measure the properties of the subject-matter, and classify the properties, accidental or specific, essential to, or descriptive of, or peculiar to, each subject or object. Most objects reveal a variety of properties divisible into two main groups : (1) " accidental," (2) " specific." Accidental properties can be changed one by one, independently of one another; " specific " properties, on the other hand, can only be changed at the expense of changing others. The same object may be classified under any one of its properties, or groups of properties. The merit of a particular classification is that it should group objects according to the greatest possible number of shared properties. A good classification should therefore, in each class or subdivision, embrace objects that have much in common, and it sorts and arranges the facts as collected in predetermined groups, predetermined because they have been selected in advance by the expert arrangement of the classification. To be able to make such a classification it is clearly necessary to possess technical knowledge and understanding of the properties of the subjects, or objects, which are to be classified, as also knowledge of the uses to which they are to be put.

Schneider states the purpose of philosophical schemes of classification to be the presentation of the structural relationships of knowledge; to divide the individual fields from their mutual sources, and, in general, logically to tie together and to arrange all the individual fields that have a common interest.

Bain defines classification as the process which in its simplest form follows the identification of like things.

He adds that it is required to " place together in classes the things that possess in common the greatest number of important attributes." It should perhaps be stressed that in organisational or management investigation the importance of an attribute is to some extent governed by the purpose of the particular investigation.

In Logic certain principles of classification have been stated and these are helpful in any field of investigation.

> " In order that a classification may facilitate the study of a particular phenomenon it is necessary first to bring into one class all forms of things which exhibit that phenomenon in whatever variety of forms or degrees; and secondly these kinds must be arranged in a series according to the degree in which they exhibit it."

The main division of the classification must, of course, be that of natural affinity, relationship, structural resemblance, or on occasion perhaps the tendency of certain elements or properties to unite with others; the classes formed by the classification must, as far as possible, represent natural groups, established by science, whose members conform to the constants of nature and are not exceptional or irregular, but the principles of natural grouping must be applied in subordination to the principles of a natural series, or regular hierarchy, particularly where elements may have a measurable or common relationship, each to its antecedent and successor, the chain idea again. The groups must not be so constituted as to bring together elements that essentially belong to different levels, or grades, or rungs of the hierarchy or ladder of the subject under classification. The primary divisions of the classification must, if possible, be founded on specific properties that correspond to well-marked, recognisable stages in the process under examination. The very best grouping can but be conditioned by our present state of knowledge of the subject under consideration.

Certain rules have been enumerated for logical division:

(1) There must be only one basis of division throughout; therefore the sub-classes will be mutually exclusive.

(2) The division must be exhaustive of the whole field.

(3) In continued division, each step must be proximate—no step omitted; step following step in due sequence.

(4) The division must be appropriate to the purpose and the subject.

Analysis, or unbinding, by itself may make confusion worse confounded unless the findings of analysis are carefully and methodically classified, sorted, and arranged. The sciences have established their basic classes; chemistry compares by

its elements, atoms, molecules; geology uses the time periods of rock-formation and subdivides by a particular igneous or stratified mineral constituent of the earth's crust. There is as yet no formal classification of the activities, or methods, of organisation, administration, or management, and in most cases the organisation or methods analyst will have to devise his own classification to meet a particular purpose, to suit the form, the subject, and the facts of his investigation. The Decimal System, much favoured by librarians for general, as opposed to technical literature, is becoming increasingly popular for manufacturing classifications, since, stripped of its subject association, it provides a flexible and convenient code for product analysis by components and sub-components, to which additions or subtractions can readily be made.

Most classifications must of necessity be highly technical to the subject with which they are concerned in minute detail, and they are therefore difficult for the layman to follow. Pfiffner offers one of farm animals which is free of technical implications.

100 Livestock
110 Cows
120 Horses
130 Sheep

131 English	131·1 Cotswold		
132 Australian	131·2 Cheviot	131·21 Black	131·211 Male
133 Austrian	131·3 Leics.	131·22 White	131·212 Female
			131·213 Baby

140 Chickens
150 Pigs

The classification is (i) by domestic animal, (ii) by country of origin, (iii) by breed, (iv) by colour, and (v) by sex, as the main variable characteristics of genus, species, order, appearance, and family. Even with sheep it would be possible to classify by a number of different properties, number of feet, cloven or other hoof, covering of hide, size of body, diet or habits, triplet, twin, or single birth. The classification is in this case designed for the farmer, or stockbreeder, who is primarily interested in breed, colour, sex, apparently the important qualitative attributes, or distinctive properties, he needs to use in his professional capacity.

The object of classification is to make comparison easy, thereby to promote the formulation of knowledge. It spreads out the existing knowledge of a subject in the form of a pattern so that the research worker compares his new fragment of knowledge with the approved pattern and is able to slip it into the right compartment, where it may suggest new thought or confirm a theory.

The use of classification is not confined to the sorting of data. In an earlier discussion of what is meant by the word "fact" an example was given of an analysis of the processes of sensing a fact—viz., the existence of a table in a particular room. In that example the sense organs, of vision and touch, registered the object as one already familiar—a table. Had the object been unfamiliar, recognition of it as a fact would have depended on further processes of sensation needed to determine its main characteristics and properties or attributes, and so to permit of classification under its particular class.

Generalisation consists in essence of the discovery in a group of observed phenomena, objects or occurrences, of invariable conditions which determine and govern the common nature or appearance of the phenomena. Generalisation does not necessarily derive from the number of instances observed, since validity does not depend solely on the number of observations. Complete knowledge and sound generalisation may on occasions that are favourable result from the careful analysis of a single instance. The validity of the generalisation rests upon the fundamental assumption that variables are excluded, that every elemental causatory fact is always definitely determined in precisely the same way, so that the relation between a phenomenon and its conditions cannot vary. Caution will be needed in using empirical laws as a basis for generalisation, laws that can be assumed to apply only under conditions and circumstances closely resembling those under which they were established.

Empirical Laws may be defined as those rules or guides which can be established through the observation and recognition of uniformities, whose existence can be proved in their effect without it being possible to discover their cause. Industrial psychology may have to rely entirely upon empirical assumption, steadied by experiment and test, but the tech-

nique is very helpful, in association with management knowledge. Many mistakes are caused in generalisation on any subject by deliberate or accidental confusion between accidents and uniformities.

Abstraction is the mental process of stripping a fact, or an idea, of its clothing of physical detail and application, leaving the principle governing its existence clear and interchangeable, to serve as the core, or the assembly jig, of countless other applications, whether of facts or ideas. Abstraction must recognise that which is essential and as a process it is itself an indispensable instrument of reasoning. It is perhaps to be regretted that the word has come to be associated with its process and so, by reason of the concentration that is involved in it, with a " fit of abstraction," or " absent-mindedness," or some visionary quality.

Locke said that " the senses at first let in particular ideas and furnish the yet empty cabinet; and the mind by degrees growing familiar with some of them, they are lodged in the memory, and names got to them. Afterwards the mind, proceeding further, abstracts them, and by degrees learns the use of general names. In this manner the mind comes to be furnished with ideas and language and the use of reason becomes daily more visible," and again, " If therefore we will warily attend to the motions of the mind, and observe that course it usually takes in its way to knowledge, we shall, I think, find that the mind, having got any idea which it thinks it may have use of, either in contemplation or discourse, the first thing it does is to abstract it, and then get a name to it; and so lay it up in its storehouse, the memory, as containing the essence of a sort of things of which that name is always to be the mark."

CHAPTER V

THE SPECIALIST METHOD (*Cont.*)

The Formation of Preliminary Ideas.—Let it be assumed that the management investigator is confronted by the class of situation that does not permit of his employing inductive reasoning; such a situation might be a threatened strike, or the breakdown of an office system. When this occurs, and if he has no facts to work from, he will have to conjecture, or propound, or intelligently guess at the cause of the problem, by forming a hypothesis and by trying it out; by probing the partly known in an endeavour to find a foundation of fact to which he can fasten his chain of reasoning, his argument or his thesis, thereby solving the problem by a happy accident, or good fortune. If his hypothesis fails he is none the worse off, rather the contrary, for he will, in the course of his explorations, have acquired knowledge of the technical or operational antecedents and consequences that are involved in the problem, and this local knowledge should be of help in the making of further exploratory attempts, the further chains of deductive reasoning needed to find the solution of the problem and to establish its cause. One way to succeed in preliminary investigation is to study the effect first by itself, entirely speculatively, to look for its uses, and upon what it depends, and subsequently to form as adequate an idea as possible of its nature, in order to be able to draw conclusions supposed to be contained in its meaning.

In the investigation of cause, as opposed to pure research, the investigator may expect to be confronted with an effect and may be asked to determine the originating cause. The difference between working from cause to effect (induction) and from effect to cause (deduction) may be satisfactorily illustrated by the different techniques employed in, say, the writing of a detective story, on the one hand, and the actual day to day work of the detection of real criminals, on the other. The author may, if he so wishes, have the advantage of devising

all the details of his story before he puts pen to paper. One pair of collaborators used to drive half over Europe, as they dictated their story to the stenographer on the back seat; they planned the crimes, and the flight from justice, of their villains and the brilliant deductions of their detectives, on the spot; their local colour was perfect, the inn, the dinner, the wine and the waiter were all true to life; their facts were piled up, fact upon impressive fact. On the other hand, the detective in real life finds his work less comfortable, more exacting. The analytical methods he employs will be different when his primary facts are confined to the crime itself, where the corpse, or the rifled safe, is the only datum. The Court will not accept intuition; facts are required in the form of a chain of evidence.

The Determination of Cause. Whereas it is simple, given a cause, to produce an effect, it is more difficult to deduce from the study of an effect what was the actual cause from the many possibilities that could have given rise to it. A number of alternative hypotheses may need to be formulated, experiments or consequences may have to be worked out and compared at intervals, or stages, and in their effect; finally, it is necessary to verify or reject each hypothesis as it is shown to fit or not to fit the facts. A number of causes may alternatively produce the same effect, and it may not be possible to state positively which of them was the originating cause, although several may have been eliminated by varying or merely by repeating the circumstances.

In the work of investigation it is necessary to distinguish between cause—antecedents—consequences—effects, recognising that within the chain of facts there will be a number of indirect and therefore unimportant by-products of the original cause; other accidental, or other non-causal, facts that are unnecessary to the actual production of the main, direct effect, with which the investigator is concerned. Any fact that naturally recurs in the chain each time that the experiment is made, but can be deliberately excluded without altering the effect, may be classed as an irrelevant antecedent and in consequence may be neglected. A cause may give rise to subsidiary effects which are unnecessary to the main experiment and these will be classed either as antecedents or as their

consequences. When, however, the omission from the experiment of any apparent antecedent cuts out the effect, clearly that antecedent is either the cause itself or part of the cause of the effect. In our examination of the collected data we must discover and set aside whatever is non-essential and contingent and consider the essential only.

To this end Mill formulated two main processes of elimination which, as "Mill's Canons," have been elaborated into five general rules of procedure. In his own words there are two simple and obvious modes of singling out, from among the circumstances which precede or follow the phenomenon, those with which it is really connected by an invariable law: (i) by comparing together different instances in which the phenomenon occurs; (ii) by comparing instances in which the phenomenon does occur with instances in other respects similar in which it does not. These he calls respectively the Method of Agreement and the Method of Difference.

1. **The Method of Agreement.** *If two or more instances of the phenomenon under investigation have only one circumstance in common that circumstance may be regarded as the probable cause (or effect) of the phenomenon.*

Illustration:

(*a*) The researcher lunches richly, suffers a severe pain, but retains the menu.

(*b*) He repeats the process next day, different meal, same pain, but he retains the menu.

(*c*) He compares menus and finds that the only ingredient common to both meals was the mushroom.

(*d*) He suspects the mushroom, but realises that the cause may have been a faulty stomach, or some other circumstance.

2. **The Method of Difference.** *If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every circumstance in common save one, that one occurring only in the former, the circumstance in which alone the two instances differ is the effect, or the cause or an indispensable part of the cause of the phenomenon.*

Illustration :

(*a*) The researcher returns to his rich meal, mushrooms again, and is rewarded with pain.

(*b*) He eats a similar meal, refusing mushrooms, and has peace.

(*c*) He compares sensations, suspects and blames the mushroom.

In this particular instance the circumstances are similar and permit comparison. In many cases it is possible to draw a faulty comparison leading to a false conclusion. Two such recurrent fallacies are well known : (i) that of attempting to compare the incomparable (*non ceteris paribus*) and (ii) of confusing antecedent and cause (*post hoc non propter hoc*).

3. **The Joint Method.** *If two or more instances in which the phenomenon occurs have only one circumstance in common while two or more instances (in the same department of investigation) in which it does not occur have nothing save the absence of that circumstance, the circumstance in which alone the two sets of instances differ is the effect, or the cause, or an indispensable part of the cause of the phenomenon.*

Illustration :

The Joint Method is, as its title implies, the association of the first two of Mill's Canons, comparing agreement in absence with agreement in presence.

(*a*) The researcher eats several different meals, all of which include mushrooms, and in each case he has a pain.

(*b*) He eats a number of different meals, no one of which includes mushrooms, and in no case does he suffer pain.

(*c*) This absence of distress confirms his theory that the mushroom was the cause of his trouble.

He has widened his sample and strengthened his conclusion, an invaluable process which the investigator will need to apply again and again.

4. **The Method of Residues.** *Subtract from any phenomenon such part as is known to be the effect of certain antecedents and*

the residue of the phenomenon is the effect of the remaining antecedents.

Illustration :

(*a*) The researcher again lunches (mushrooms served), but drinks an inferior wine.

(*b*) He has a great pain in the stomach and another in the head.

(*c*) He attributes the headache to the inferiority of the wine.

Westaway quotes the use of this method in Astronomy. The disturbance of the orbit of Uranus was observed to be greater than could be accounted for by the known planets, Jupiter and Saturn, and so the existence of another planet was assumed, also capable of influencing the orbit of Uranus. The existence of this hitherto unknown planet, Neptune, was subsequently proved. The method clearly has application where physical experiment or measurement is impossible.

5. **The Method of Concomitant Variations.** *Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon, or is connected with it through some fact of causation.*

Illustration :

(*a*) Our researcher now has some pain constantly.

(*b*) He has a great pain after eating mushrooms.

(*c*) He attributes the increase in his pain to the mushrooms.

This method is of more general use in establishing a generalisation wherever the symptom cannot be completely eliminated, but can be reduced.

These five canons or methods of elimination *are applicable to all simple phenomena produced by one single cause when expressed in an effect which can be isolated and recognised.*

Plurality of Causes and Intermixture of Effects. In many cases a phenomenon may consist of an " Intermixture of Effects " brought about by a plurality of causes, and this will make the Method of Agreement uncertain and inadequate. An example is the case of unhealthy children born of healthy

parents, whose ill-health cannot always be attributed to the one cause, of immediate parentage, but may be engendered by surroundings, faulty diet, infection, contagion, apart from some remote hereditary tendency to ill-health that may have by-passed a generation. The tracing of cause may be aided by increasing the number of samples selected for observation. This will establish a number of separate chains of causes and effects, and will simplify the complex effect. Another solution may be reached by concentrating upon decisive cases of agreement in absence, where it is possible to associate failures to materialise an effect with the repeated absence of one particular cause.

In the Western Electric Company's experiment into working conditions, variations in the degree of illumination of work were not necessarily accompanied by any corresponding variations in observed output of work. It became recognised that there was at least one uncontrolled and possibly uncontrollable variable, that of the human desire to work; it was realised by the investigator that the ordinary tools of measurement were incapable of separating and evaluating the complex of individual idiosyncracies and human requirements; it was recognised that some variations develop from knowledge on the part of the human beings experimented upon that they also are of importance; as a consequence of such knowledge new attitudes emerge, with responses, in terms of output, which were conditioned by satisfaction or dissatisfaction at being the objects of so much study and interest. In dealing with things, with the inanimate, the analyst may find single causes expressing themselves in simple effects, but when studying human situations causes and effects are nearly always complex.

Experiment by Varying the Circumstances. Any phenomenon or problem will contain a thin chain of cause and effect round which is wound a web of relevant and irrelevant circumstances in such quantity as will normally obscure the chain. Whatever the form of the experiment it is necessary to maintain all other circumstances and conditions strictly unchanged when varying circumstances one at a time. If in such processes there is no variation in the effect, the circumstance or condition omitted was not essential to the effect. If there is a variation, then clearly the circumstance omitted must be causal. Mill's five

methods of elimination will suggest means of varying the circumstances of experiments.

Observation, Selection and Isolation of Factors. John Dewey, in discussing reflective thinking, sees two stages that are involved: (1) a state of doubt, hesitation, perplexity, mental difficulty ("divine discontent" or healthy dissatisfaction with the *status quo*), and (2) the processes of searching, enquiring, in order to find a means of relieving the former state of uneasiness. Serving both these processes and all the processes of investigation is the joint endeavour, or combined operation, called observation, that consists of sensing and recognising.

If six different people, not specially and identically trained, examine or otherwise study the same view at the same time, it is probable that each will observe, register, or select some particular object or objects as significant, although all share the same general vista. All six may have employed similar processes, with a different product of seeing and perceiving, and will have concentrated on particular and differing aspects of the general scene. Observation would seem to be carried on by a joint activity, of sensing (seeing, feeling or hearing) and classifying the objects sensed against a pattern of first- or second-hand experience. Two people sensing the same object may well, each in his own observation, reflect his personal experience or knowledge of similar phenomena and their composition: this forms part of the more general process of perception—viz. the mental association and comparison of the objects sensed with ideas and inferences, preparatory to their recognition and registration for subsequent reasoning, experiment, and testing.

The six observers, if untrained, may well have registered several different observations conditional upon: (i) whether some were looking for something they expected to find, in which case they are quite likely to discover a partial truth; (ii) the differences in the experience of each which must influence, if not determine, the apparent form and the thing perceived. Such "observations" may be of a similar character to hypotheses, just as likely to be wrong as right, dependant equally upon the qualities, rational and irrational, of the thinking subject.

By contrast the trained observer learns to view the scene

and record its salient features, and then by selection, isolation, and concentration upon each segment, study its composition in order to register what component parts make up the whole and what is the nature of each part. To be able to do this it is clear that, in addition to powers of observation, he must possess, or have recourse to, technical knowledge and understanding of the composition of the objects under observation, and this reflex he must maintain throughout the combined operation of sensing and classifying. Observation is, then, a precise process requiring, as complement, general, if not detailed knowledge of the object. The human eye cannot compete with the precision, breadth of vision, and speed of the camera, nor can the observer as faithfully reconstitute what he has seen: he must therefore study and record with infinite care; he must etch his experience in his memory, or record it quickly, before it fades or changes.

Mayo says that the difference between a good observer and one who is not good is that the former is quick to take a hint from the facts, from his early efforts to develop skill in handling them, and quick to acknowledge the need to revise or alter the conceptual framework of his thinking. The other, the poor observer, continues dogmatically onward with his original thesis, lost in a maze of correlations, long after the facts have shrieked in protest against the interpretation put upon them.

A sentence from Descartes may console those of us who do not rate our own minds as high as we rate those of other men.

> "The diversity of our opinions does not arise from some being endowed with a larger share of reason than others, but solely from this, that we conduct our thoughts along different ways, and do not fix our attention on the same objects. For to be possessed of a vigorous mind is not enough; the prime requisite is rightly to apply it. The greatest minds as they are capable of the highest excellences, are open likewise to the greatest aberrations; and those who travel very slowly may yet make far greater progress, provided they keep always to the straight road, than those who, while they run, forsake it."

Discovery is in real life usually the result of painstaking, pedestrian, hard work; it is seldom intuitive, brilliant or theatrical.

Form and Presentation of the Conclusions.

The records or working papers of an investigation which has followed the lines suggested in this book will have the content, but not the form needed for a report. There will be an essential difference between the records that are designed to aid the researcher and the report that, if it is to be widely read, must be planned, written, and presented in a form that suits and pleases the reader.

The work of report writing will consist of recasting the records already made in a form that will present the information collected in another order, one that will not only carry conviction, but will be readily understood. It demands of the writer " the gift to see his facts as others see them."

Whereas no two readers will have identical preference for presentation, it is still possible to take an average of readers and to discover a layout that will suit the majority, while offending no one. We must unfortunately disregard the technical colleague who has been waiting for this report and will therefore read it avidly, however it may be presented; we must concentrate upon the man who has other work to do, whose time must be safeguarded, whose interest has to be aroused and his initiative gradually led to the detailed conclusions and to a decision to implement them. No set order of presentation will suit all fields of enquiry and all audiences, but the arrangement suggested may well carry conviction and be easy of argument.

Statement of:

1. The object of the investigation. Definition of the subject.
2. Scope of the research and of subject treatment. (*a*) Contents of report.
3. Summary of conclusions.
4. Summary of recommendations.
5. Background, historical or topical.
6. Notes on the method followed in research, equipment and apparatus employed.
7. Description of investigation procedure.

Statement of: 8. Discussion of findings.
9. Conclusions and recommendations.
10. Appendix, Bibliography.
11. Index.

This is a formidable list, but some of the items should be mercifully brief, no less because it is unwise to omit any one of them.

1. *The object of the report* will sometimes have been made clear and conveyed in the title. Alternatively it could perhaps be inferred from the terms of reference, if these are clearly drawn. In an industrial or engineering investigation the object will be straightforward and objective, for example, to determine the advisability of purchasing certain machinery, or of erecting a factory extension, or of closing down an office or a depot. Whatever the object of the report may be, every endeavour should be made to present a concise and clear statement of the findings.

If it should be necessary or helpful to define the subject within which the investigation has been made the rules of definition should be observed. These are :

Consider the thing, the name of which has to be defined as a " species " ; place this species under its " genus " and determine the " difference " ; the genus added to the difference will give the definition.

As an example let us consider a geometrical figure, a quadrilateral, whose " genus " is a rectilineal figure, whose difference from other rectilineal figures is that it is four-sided. Following the rules the definition becomes :—a quadrilateral is a rectilineal figure with four sides.

2. *The scope of the report.* A single paragraph should be all that is needed to outline the scope of the enquiry, and it should be so written as to answer the question that may be in the mind of the reader, as to how deeply, how thoroughly, how wide and over what period of time the investigation was made. This will be particularly necessary when sampling has taken place. The reader will need this information and it should not be omitted.

2. *Contents.* Where the titles sufficiently convey the interest and importance of the various divisions of the report, their statement, with the page or paragraph number, will suffice; where on the other hand such titles seem too general, it may be necessary to list the sub-titles, the subject headings, or to state them in telegraphic form, omitting verbs. No generalisation is possible, but brevity, clarity, and simplicity are important.

3. *Summary of Conclusions.*
4. *Summary of Recommendations.*

} Two separate précis of the matter contained in item 9.

These two are specifically inserted to save the reader's time and to simplify what may be a technical report. They should be absolutely elementary in thought and words, however technical the subject and the report. They are frequently " lifted " by reviewers, in whole or in part, and if the report has general interest the summaries should be written with this possibility in view. They should always be tried out on a " man in the street," or his equivalent, to ensure that they are in fact simple and intelligible to the layman. In the case, already quoted, of a comparatively straightforward object, such as the advisability of purchasing certain machines, the summary might consist of a statement that the report itself makes it evident that such a purchase would, or would not, be profitable.

5. *Background.* The report writer will have to consider how much the reader needs to know about the subject, and its circumstances, in order to form a balanced view of the findings of the report. It is not a bad rule to incorporate under this heading all the footnotes of general explanation of circumstances and conditions that would otherwise have been included in the main discussion, introducing such words and thought as are needed to help the technical reader to get this particular report into perspective. It will not be possible to enable the general reader to short circuit the acquisition of the technical knowledge needed to understand a technical report, nor should the background attempt to do this. It should introduce the situation that gave rise to the report, but should not introduce the report itself.

6 and 7. Notes on method and description of procedure are purely factual sections of the report, subject to the same advice

already proffered on clarity, brevity, logical reasoning, and presentation. They, the notes, are immediately available from the working papers of the investigation.

8. *Discussion.* What are the " occupational qualities " on the part of the writer that will be appreciated by the reader? The Social Security Board, U.S. Government, once issued the following circular.

CHECK YOUR WRITING

Can you answer " YES " to the following questions about each thing you write?

Is it:

1. COMPLETE?
   (*a*) Does it give all necessary information?
   (*b*) Does it answer all questions?
2. CONCISE?
   (*a*) Does it contain only essential facts?
   (*b*) Does it include only essential words and phrases?
3. CLEAR?
   (*a*) Is the language adapted to the addressee; are the words the simplest that carry the thought?
   (*b*) Do the words exactly express the thought?
   (*c*) Is the sentence structure clear?
   (*d*) Is each paragraph one complete thought unit?
   (*e*) Are the paragraphs in proper sequence?
4. CORRECT?
   (*a*) Is the information accurate?
   (*b*) Do the statements conform with policy?
   (*c*) Is the writing free from errors in grammar, spelling, punctuation?
5. APPROPRIATE IN TONE?
   (*a*) Will the tone bring the desired response?
   (*b*) Is the writing free from antagonistic words and phrases?
   (*c*) Is it free from pompous, hackneyed, or " bureaucratic " phrases?

There is much excellent advice contained in that short list. In addition, the writer must study layout, typing, printing, paragraphing, spacing; he must ensure that the clarity he achieves in his thought and words is not lost in their reproduction on paper. Jargon must be avoided; logical reasoning must be employed; sufficient facts included to give conviction without surfeit.

A good report, like a good organisation, must build up a structure that can be closely related and co-ordinated into a harmonious whole. The discussion of facts and findings must follow a logical pattern using inductive reasoning, piling fact upon fact. It must not in any degree employ salesmanship. This, the body of the report, will be purely factual, analytical, rational, scientific, and impersonal. It will closely follow the lines of the investigation itself. It is not possible to suggest the words that will be employed, but it is permissible, to requote Locke . . . to use the same word steadily for the sign of the same immediate object of the mind in thinking; to join these words together in propositions according to grammatical rules and to unite these sentences in a coherent discourse.

It is possible to learn something from books on the form and method of report writing, but the " finish " to the report, its quality, will be given by the thought and words that are employed. Something can quite quickly be learned from others about the process of thinking, but a man's vocabulary is often his own experience of words. He can add to it only gradually, must go about its enlargement methodically, with the aid of reading and a dictionary, making new word-friends but studying their meaning as he meets them. He should keep good company in his reading and study the editorials of the leading newspapers.

9. *Conclusions and Recommendations.* Conclusions are scientific and objective. The recommendations may on occasion be subjective, may reflect the opinion and the experience of the investigator. In some cases recommendations should be made tentatively, offering alternative courses if possible, leaving the decision entirely to the persons to whom the report is made. In others the report must outline the actual methods to be followed to implement the recommendations.

On some occasions and under some circumstances the recommendations themselves must be strong in salesmanship, or the report will join the pigeons. There is then a strategy and there are also tactics governing the writing of individual reports that an able man may master. The novice should stick to science and truth; he will find them good companions.

10. *Appendix.* Bibliography. Any part of the report that is explanatory to the main theme, or in the nature of a detailed proof of a point, that will be read only by the technical man, may be placed in an appendix. In the same way and in the same place a bibliography may usefully be compiled and published. If the references in the text are to authors, the bibliography should be arranged alphabetically by author's names; if the references are to subject, the bibliography should be classified first by subject and then by title or author, whichever is the better known, the more usual key to reference in the particular profession or field of literature. If the reference is specific and authoritative, the actual page or chapter should be mentioned. The bibliography should seldom be exhaustive. Sufficient titles are required to give statutory authority, the "comfort" of another's agreement, the expansion of an argument, or the illustration of a point more fully than is permissible in the text.

Postscript to this Chapter.

As a contrast to the formal discipline of logical reasoning advanced in this chapter and in an endeavour to restore the human touch to reason, it may be interesting to introduce at this point, and in the form of a postscript, a suggestion as to the contribution that the individual himself may make to both process and product of thinking—in the sense of the application of knowledge to a practical end.

The art in thinking rests in the ability and the skill with which a person applies his powers of intellect, his inner self to a particular isolated idea or image, or to a problem that in itself may comprise a series, or chain of ideas. If an idea is worth thinking about, that is to say, whether it is new or an old friend, if some worthiness is apparent in the idea, an unsolved quality remains with it; something still has to be fathomed in it and

this maintains its interest and its worth. The presence of such a quality suggests that this worth-while image, or idea, had its origin apart from the thinking subject; it may have been received or deliberately collected from outside, thus constituting a first process of thinking, that of the reception or creation of the idea, prior to the second process of thought itself. It will be obvious that any art in thinking will be more readily learned and should be practised in greater comfort if the thinker can be by himself and can enjoy the privacy that under ideal conditions becomes solitude. To some people this particular condition gives enjoyment, but to others with a sociable or gregarious nature, the state of solitude needed for reflective thinking may be unwelcome, undesirable, or unobtainable; by them serious thought is usually avoided, until the need for it has become very pressing.

The first stage in individual thinking is to be alone, physically so if possible, but, that failing, to be mentally alone, by so concentrating, or centring oneself upon one's self, as to shut out all intrusion of other images or ideas, self-generated, or extraneous. Solitude itself may be boring or inspiring, according to the dictate of one's nature; if it inspires, it does so by an intensification of ability, through the elimination of distraction and the consequent freeing of the brain and the canalising of its activities along a single purpose. It sets one's faculties free and gives them untrammelled, unexpected play. Dimnet speaks of "*interior solitude*" and calls this state of mind "*concentration*," whose process is the elimination one by one, or of all by one sweeping effort, of the images foreign to a chain of thought; figuratively he likens the process of concentration to the folding of wings about the subject under attention, to the exclusion of distraction. He adds the comforting thought that this particular art usually has to be acquired by patient practice, except where a strong personal interest produces a natural and automatic concentration. There are fortunate people who find no difficulty in obtaining "interior solitude" when in a crowd, in a tube for instance; they have great powers of concentration.

There is individual thinking and there is collective or group reasoning or perhaps thinking, a process developed in American universities in the seminar, and in adult education through

discussion groups. In such group thinking a small number of persons use the same process of reception, share the same introduction of subject or ideas, by reading or listening to the same problem outline, or the same " lead in." If they succeed in working together as a team, each may stimulate the thinking of the group, invigorating his own powers and those of the other members by contributing to, or feeding the stream of thought, that in its flow may then carry all members of the group with it, and may almost rise to flood level, through the very human reaction of giving of one's best before an audience. Most men enjoy sensations of power and admiration, both of which may arise in group discussion, but the simile used should also convey warnings against the rapids and the whirlpools of thinking. There is then a great need for a pilot who knows both the shallows and the deeps of the subject, who has also the " know-how " of thought steering. In the face of physical problems most groups will automatically throw up their own leader or officer, as is rediscovered during every war, but mental leadership does not seem to develop as an automatic reaction to a situation demanding careful reason (as opposed to swift action) for its solution. Discussion lends itself to whirlpools or roundabouts that lead nowhere, unless it is most intelligently primed and led, but group thinking has at least one great advantage over individual thinking, and reading, because it should develop an added interest and value from a many-sided approach that might have escaped the attention of most individuals. Concentration is often automatic as soon as interest has been aroused and group-thinking should therefore aid concentration which is otherwise difficult of achievement where the subject is foreign or strange. Anything that breaks the ice of strangeness or unreality is invaluable as an aid to thought upon new ideas, and it is perhaps in this interest-creation and the systematic marshalling of ideas and inferences that the art in thinking lies hidden.

CHAPTER VI

THE CONTRIBUTION OF ORGANISATION TO THE FUTURE

THE thesis of this book is that civilisation, or economic progress, demands the act of specialisation on the part of individuals; that the specialisation of work requires organisation by function, to allow the specialist to be effective in his task; that functionalisation needs careful organisation and close co-ordination of its specialised activities, to ensure harmonious working and progress. The circle is complete, yet it leaves unstated, and unanswered, a number of important criticisms that are often made against our present economic organisation, criticisms of such fundamental importance that no book on specialisation and management could honestly disregard them. Three such complaints against organisation may be stated and examined for the contribution that their satisfaction can make towards the improvement of business relations, employment relations, vendor-emptor relations, and government-citizen relations.

1. That morals and ethics are insufficiently observed in business and are not at present functionally or otherwise directly represented in management.
2. That national and governing policies are too often guided by expediency, instead of by objective criteria.
3. That the best use is not made of specialists, nor are their services well co-ordinated.

If organisation is held to be responsible for the correct allocation of duties to posts, through which responsibility passes to individual staff, then these criticisms of the execution of implied duties, or of failure to execute them, are in effect criticisms of the way in which we organise our society, our government, and our industry, and of our administration and management of all three activities. It may be interesting to study these criticisms in the light of principles of organisation and in the hope of

suggesting ways and means by which the faults, if any, that gave rise to the criticism may be removed at their source.

1. **Morals and Ethics.** Durkheim poses a rhetorical question as to what the relations should be between employer and employee, worker and manager, between tradesmen in competition with one another, and the public.

> "Indecisive formulas would be obtained; some generalisations, without point, about the faithfulness and devotion workers of all sorts owe to those who employ them, about the moderation with which employers must use their economic advantages, a certain reprobation of all competition too openly dishonest, for all untempered exploitation of the consumer; that is about all the moral conscience of these trades contains. Moreover most of these precepts are devoid of all judicial character, they are sanctioned only by opinion, not by law; and it is well known how indulgent opinion is concerning the manner in which these vague obligations are fulfilled. The most blameworthy acts are so often absolved by success that the boundary between what is permitted and what is prohibited, what is just and what is unjust, has nothing fixed about it, but seems susceptible to almost arbitrary change by individuals. An ethic so unprecise and inconsistent cannot constitute a discipline. The result is that all this sphere of collective life is, in large part, freed from the moderating action of regulation."

He concluded that to consider wealth as immoral is not less deadly an error than to see in wealth the good *par excellence*. It is not clear that Durkheim had any precise remedies in mind when he wrote this in 1933, nor did he take an exaggerated view of the importance of ethics, for, in another context, he wrote that morality cannot excessively govern industrial, commercial functions, etc., without paralysing them. He added that they are none the less vital. It would be difficult, and extravagant of time and efficiency, to provide for separate organisational representation of morals and ethics in all enterprises, if it were at all possible to do so. Before making any such attempt, it would be necessary to secure agreement as to what constitutes universally acceptable moral standards, a preliminary that has

defeated moralists for many years, particularly when they attempt to translate their principles into the application of buying and selling at a profit. Looked at from these angles the difficulties appear insuperable. The single enterprise cannot be expected, on its own, to evolve and enforce a code of morals, economic and managerial, although experience shows that many pioneers have led a way that has not been generally followed. Yet the problem that is insoluble at the circumference of a circle, where it touches the individual interest, may yet be soluble, administratively, at the centre, where a comparatively slight reorientation of purpose, or other collective reorganisation, may produce the effects desired and at all points of the circumference, for all the individuals whom it concerns.

Accusations of injustice or of amoral behaviour are usually founded upon experience or knowledge of unfair treatment of individuals or a class, whether the behaviour that gave rise to the accusation was deliberate or accidental. In either case a defence might be raised by the accused that his behaviour was fair, in the absence of any standard against which he could be measured and of any published code of behaviour that interprets the detailed actions of to-day, in the technical language of to-day, against a generally accepted ethical body of principles and rules. Such a defence is at the moment unassailable. If we ignore the code of behaviour and concentrate upon the organisational cause of the injustice, it is usually found that accidental unfair treatment is due to an organisational fault, or omission to consider and provide for the representation of an interest. It is usually nobody's job to see that Mrs. Consumer is not overcharged, or is told that stocks of an article she has been waiting for have at last become available, or that Miss Employee understands a complicated premium bonus scheme. Both, in this hypothetical case, were angry because they had been robbed, had missed an opportunity, or overspent a small wage.

Some of the genuine injustices could be prevented by the organisational representation of the major interests (staff and consumers are two examples) at the stage of policy formation. *In any organisation headed by a committee any reasonable number of interests, of capital, technical of product, or functional of management, can be represented and integrated at the policy level,*

before action starts, although it is difficult to keep changing the course of policy once production is under way. Similarly any interest on the committee can be kept constantly advised of progress as action develops.

First for consideration is the consumer interest, particularly because of the value to marketing that usually follows any such study. Perhaps this interest could be summed up as the need for goods to be made conveniently available at a fair price and for services that should be speedy, technically efficient, and polite. It is improbable that any one person will, in his own experience, be fully representative of all the interests of a number of consumers, who have no association the one with the other, except for the accident of having bought an article of identical kind and make. If such a representative were elected, or otherwise appointed, to represent the others on the board of a trading company, combine, or nationalised industry, it is more than probable that this work would produce in him a particular attitude; either he would lose his identity as a consumer and identify himself with the advantage of the company, or, retaining his representative interest, he might become provocative on behalf of his employers and endeavour to secure a predominant, special-interest treatment over other technical and functional considerations of the enterprise. Such a trustee would offer little more than a nuisance value, where positive, constructive help is required.

If on the other hand a director were to be carefully selected and charged with the specific duty of acting as trustee for the consumer interest, and equally other directors were appointed to represent other primary interests, it is thought that these difficulties would be overcome. Trusteeship for consumers must not be confused with the functional directorial responsibilities for the distribution and the sale of the company's products, for instance, the function that is concerned first with the disposal of goods, already manufactured, by advertising and creating a demand, or by satisfying an existing demand for them. The duty of the trustees would be to guarantee to the Board of Directors that their policy decisions had taken all the interests of the company fully into account; that such decisions as affect their relations with the public were, so far as economically possible, fair to the consumer interest—to

ensure in fact that the Board had deliberately and specifically considered the effect their policy would have, in this particular case, upon the consumers. Such a trustee must owe, and pay, loyalty to the company and, strange though it would seem, he would in fact have no direct relationship with the people whom he represented. The impossibility of effectively serving two masters with a divergent interest makes this clear and necessary.

No able director could exercise such a trusteeship for long without at the same time accepting the duty to voice the interest of the class he was representing, yet he must not obstinately try to insist upon the complete satisfaction of this interest at the expense of other essentials. No one interest should be permitted to override the others, and the Board, or other committee responsible for continuity and operation, must alone decide what course will best meet the combined interests of all. Definite responsibility for results must be accepted by named individuals; the line down which power and authority travel must be clear; controls and records must be made available to the management to ensure effectiveness and efficiency, essentials that demand the minimum of interference with the executive process. *The trustees would be appointed to prevent, directly, the overlooking of any particular interest and, indirectly, to create an attitude of mind that would not permit the deliberate exploitation of a class. Such a trustee-responsibility may well be an essential to free enterprise.*

For some years experiments have been made in devising new forms of top direction; "working directors" (elected or selected from the ranks, usually for a year); "junior Boards of Directors" (after the McCormick plan and to give experience to staff); interlocking directorships (to tie important consumers, or other interests). The suggestion, now proposed, would not interfere with such experiments, would merely add to the number of them, and if taken up by progressive companies might intelligently prevent criticism, increase goodwill, and improve organisation.

There will be a number of interests that need representation, if industry is to take its place as an example of fully democratic self-government, in the sense used by Herodotus—the form of government in which the ruling power is not in any particular

class or classes but in the members of the community as a whole.

1. Capital, or Shareholders.
2. National or social interests, represented by liaison with Government.
3. Staff and Labour.
4. Customers.
5. Suppliers of raw material.

Neglect of any one of these interests may lead to accusations of injustice towards one or other of these economic, or power groups.

If it is generally recognised that these various interests have a right to consideration in the planning of the activities of an enterprise, it might also be assumed that just as capital has an annual meeting of shareholders to ensure that its interest has been observed, so also staff and labour might hold comparable meetings for the same purpose, as in fact they do in some undertakings. Carrying the thought one logical step further, machinery could equally be set up to receive and investigate complaints that any other trustee interest had not been fairly treated. It is more than possible that the provision of such machinery for criticism together with the appointment of trustees would give the momentum necessary to eliminate the cause of the complaint at source.

In an emergency only one man must give the orders. The world and the emergency will not wait for everybody to be consulted. The majority must delegate its power to the minority to govern, or there will be no decision and no government until it is too late, but the majority may be entitled to choose its managers for executive qualities.

It has often been said that a thoroughly efficient government, if such a body could exist, whether of State or Corporation, must automatically develop into totalitarianism. Democracies have perhaps been at pains to ensure that there is no risk of any such accusation, but in their case they are already fully armed against too autocratic an attitude by the constitutional provision of external organised criticism in the

shape of Parliamentary Questions, and in the person of Select and other Investigating Committees. Should not this tool also be tried, in the limited way suggested of representation of interests, for the National Corporation, if for no other? It could be employed to increase efficiency while guaranteeing no loss of liberty.

Under the conditions suggested, a Board of Directors would increase its own specialised activities only by one.

(*a*) Chairman and Deputy Chairman.

(*b*) " Operational " directors, or " Contact " directors.

(*c*) Functional directors (production, distribution, accounting, managing, and others).

(*d*) Outside technical advice (legal, financial or general wisdom).

Additionally,

(*e*) Trusteeships.

This increase in activity need not necessarily add to the numbers of directors, although it would perhaps require activity of some sort on the part of all directors. It is possible that in some companies the rôle of trustee might be doubled with that of responsibility for an operation or a function, provided that the rôles were not so alike as to make it probable that one would be submerged or engulfed in the other. For instance, the distribution director would not be a suitable man to serve as consumer trustee, in view of the clash of responsibility that might arise from the dual rôle, but it is possible that the production, or accountant, director could serve in that capacity and could increase his value to the company by so doing. It must be repeated that the trustee must be appointed by the Board of Directors and not by the Shareholders, or by the Unions, that his work would be representative of an economic and managerial interest and not in any sense of any class. Capital, or the Unions in co-operation, could make representations to the Board on any occasion of injustice, real or imagined, but the trustees should not be concerned with individual cases, and, following the principle that prevention is better than cure, their preoccupation would be with the removal of cause, not

with treatment of effect. The organisation of French Nationalised Industry to be referred to on page 74 confirms the principle of the appointment of trustee directors. The "Contact assignments" given by Standard Oil and Unilever Ltd. to their directors are also similar.

As the Democratic movement spreads from Government to Industrial Employment, and there are already clear indications of changes to come, greater attention may need to be paid to the duties of directors and to the effectiveness with which these duties are discharged. J. C. Baker has contributed an interesting analysis of these duties:

> "Directors consider and approve the basic policies under which a corporation operates, such as the following: what products should be made, what facilities used, how products should be made, what facilities used, how products should be sold and how financed; also price policies, important advertising policies and other relations with consumers, distributors, labor and government.
>
> Directors check executives and the results they secure.
>
> Directors supervise, control and act on important financial matters.
>
> Directors approve and review capital and operating budgets.
>
> Directors approve selection of general counsel and formal action required by law.
>
> Directors establish the salaries of senior executives, approve bonus and pension plans, and control all other policies relating to payments to executives.
>
> Directors have the critical function of asking discerning questions at board meetings.
>
> Directors are responsible for presenting an outside point of view. They see that proper basic relationships exist among all groups: stockholders, the public, creditors, labour and customers.
>
> Directors represent all stockholders.
>
> Directors inspect properties and review actual operations.
>
> Directors are responsible for proper inside as well as outside audits.

Directors scrutinize or have legal counsel or expert consultants to do so for them, all corporate action affecting their trustee relationships.

Compare the top direction for French Nationalised industry, laid down in March 1945, to govern the organisation and working of Renault.

The Governing Body consists of the President and fifteen other members appointed by order of the Minister of Industrial Production, as follows: two members designated by the Minister of Industrial Production, one of whom is to serve as vice-chairman; one member each designated by the Ministers of National Economy, Finance, Public Works and Transport, Labour and Social Security and War; two members designated by agreement between the Minister of Industrial Production and the Minister of Public Works and Transport, *to represent users of motor vehicles; three representatives of manual workers; one representative of salaried employees and foremen; and two representatives of engineers and heads of services.* The staff representatives are chosen by the Minister of Industrial Production from among the regular staff delegates to the central works committees.

Members of the Governing Body, with the exception of the President, are appointed as a rule for a term of six years, but one third of their number are renewed every two years.

The main duties and powers of the Governing Body are:

(i) Examination and approval of production programmes and programmes of expansion and reconstruction.

(ii) Approval of plans for the establishment of new factories or new branches.

(iii) Preliminary examination and approval of estimates of income and expenditure.

(iv) Examination and approval of the President's annual report to the Minister.

(v) Preliminary examination and approval of working account, profit and loss account, balance sheet and proposed distribution of profits.

(vi) Approval of long- and short-term loans and issues of bonds.

(vii) Approval of purchases and sales of real property and establishment of securities or mortgages.

(viii) Approval of investments in other undertakings under conditions specified.

The Decree provides for the appointment of a central and local works committee.

It is not thought that the director's duties named by Baker have in any way been idealized, largely because in some shape or form they exist, and are in fact undertaken in some public companies, or are neglected in others. The bare list of them, without elaboration, suggests that to be a director in the full meaning of responsibility for management, and quite apart from legal responsibilities, demands qualification and perhaps training. The Directors of some companies already specifically cover many of these duties, if not all of them, but it is not thought that such good practice is general. It might not be out of place, however, to state that humanity in general and directors in particular are neither of them as thoroughly bad, or as thoroughly good, as the cynics or the faithful of any particular creed would have us believe. If they are bad they can always be changed. If they are good they can be imitated. It is clear to many that if responsibility for Morals and Ethics is left to chance, or the generosity or patronage of the individual, there will be many cases of disappointment for the conscientious and of injustice for the unprotected. The conscious and formal organisation outlined would in many cases cost nothing more than the careful thought of men who would be selected from the most able in the employment of the company, and their active trusteeship might well guarantee complete equity and justice to all of those whom their business touched. Democracy does not progress by beheading the inefficient or the amoral, but by raising and setting new standards of behaviour to which the amoral are suitably encouraged to conform. Any organisation whose form is autocratic, in the sense that one man is judge, controller, and director, is foreign to a period of representative government, yet change from direction to a policy of consideration of interests and their

consultation needs to be gradual and to be accompanied by some education of those who are to be consulted, education in the use of their new duty and its responsibilities. With the long-term view in mind the new relationship that would result might pay a handsome dividend. It is clear that some well-managed companies make use of the best organisation in an informal way and in such cases the formalisation and recognition of existing practice alone is needed for continuity, for the time when the company grows beyond the optimum size, or loses those founders or executives whose experience, in all fields of the enterprise, led to the representation, in their own decisions, of all the interests and classes affected by the business.

The Canons of Efficiency. Mention has already been made of the Canons of Logic as enumerated by John Stuart Mill, but the President's Committee on Administrative Management stated six other canons that may round off the thought advanced in this chapter.

> "The efficiency of government rests upon two factors: the consent of the governed and good management . . . fortunately the foundations of effective management in public affairs, no less than in private, are well known. They have emerged universally wherever men have worked together for some common purpose, whether through the state, the church, the private association or the commercial enterprise. They have been written into constitutions, charters and articles of incorporation, and exist as habits of work in the daily life of all organised peoples. Stated in simple terms these canons of efficiency require the establishment of a responsible and effective chief executive as the centre of energy, direction and administrative management; the systematic organisation of all activities in the hands of a qualified personnel under the direction of the chief executive; and to aid him in this, the establishment of appropriate managerial and staff agencies. There must also be provision for planning, a complete fiscal system, and means of holding the Executive responsible for his programme."

The Byrd Committee's report, upon the Brookings Institution's Investigation of Executive Agencies of the U.S.

Government, offers an analysis that supplements these "Canons."

> "One must keep constantly in mind such factors as the demands of effective service and true economy; the need for simplification; the measure and manner in which overlapping can be dealt with through cooperation and coordination; the elimination of unnecessary duplication; the significance of quasi-legislative and quasi-judicial functions and of subsidiary or facilitating activities; the lessons of history and the force of tradition; the special situation of new and emergency agencies; the meaning of objectives and the distinction between major and incidental purposes; the combinations and cleavages produced by policy; the effects of specialisation in personnel, procedures and equipment; differences in the nature of the load and in speed of operations; the size and number of agencies; and the requirements of overhead supervision and overall coordination. *No single factor can be decisive throughout the entire organisation.* One factor may help us to decide at one point; elsewhere another factor may be more helpful. At every point one determinant must be balanced against another. For some functions and some agencies there may be no one best course of action. A choice may be presented between alternatives, one as desirable as the other."

Chester Barnard suggests that the capacity of responsibility is that of being firmly governed by moral codes—against inconsistent immediate impulses, desires, or interests, and in the direction of desires or interests that are consonant with such codes. He continues by pointing out that the chief difference between the lower and the higher ranks is not in the capacity of responsibility, but in the condition of moral complexity, and he suggests that higher positions impose more responsibilities, but do not require greater sense of responsibility in important degree.

2. **Expediency or Objective Criteria.** An engineer knows that he can make or improvise "one off," or a single specimen, of any simple product, without of necessity having been sure, when he started, what it was that he would end up by making.

This is not production of a number of things, it is perhaps the design of a single individual prototype or model. So also with research; history shows that many great discoveries have been made when the research worker was looking for something quite different; his discovery was in such a case accidental, in that it was not planned or designed, and may not have been premeditated, depending for its origin upon the noticing by the research worker of an interesting side issue, or quite separate phenomena. Yet both engineer and scientist agree that if you wish to repeat the phenomenon, to produce exactly the same result again and again, it is necessary to record most accurately and carefully the details of each process, the quantity of each material used, to list each step followed, so as to build up an exact specification, a process layout, or plan of production.

Before anything can be made in quantity and equally before anything complicated, or bedevilled, can be made at all, it is absolutely essential to economy and efficiency to prepare a plan showing what it is that you are going to do, or to make, in whole and in detail. The alternative is extemporisation, improvisation, no two products the same, no two "identical" parts interchangeable, no guarantee of technical accuracy or quality, probably muddle, sometimes chaos. This concept is axiomatic to the engineer, who has proved it so often that he expects other people to understand the necessity for it and he is puzzled to find that his knowledge is disregarded in some administrations that claim to be constructive in character.

Yet production is not always the dominating factor. On occasion some other primary function, or combination of such functions, must and does have the last word. An excellent example of this is available from aircraft production in war, which has to maintain a nice balance between quantity and a variable factor that is governed by operational requirements. In their turn operational requirements are constantly altering, according to changing strategy and tactics, on the one hand, and to meet the opposition of new enemy aircraft and new offensive and defensive armaments, on the other. Under such conditions production gives precedence to development, but both have to be integrated; that is to say, the technical requirements of both have to be respected, or the aeroplane will not be produced, or, having been made, will not return from

operations. If every new modification to design was permitted to stop production, while plans were amended and machinery adjusted, very little output would have resulted. Modifications to design have to be analysed and graded according to their urgency: (1) Safety; (2) Urgent operational improvement; (3) Desirable operational improvement. In the case of (1) the modification would take the form of stopping the production line until the new process was introduced; of (2) it would mean that such modifications would be collected for introduction together in a batch, to minimise the dislocation of production; in the case of (3) modifications would only be made operative at the convenience of production. In all except the first case, production has the opportunity to plan its work, to think before it acts. The emergency was so real and the objective so clear that production management was fully aware of the need for the executive balance to be upset, and staff and labour accordingly made superhuman and successful readjustments to infinitely complicated programmes and processes, in order to provide what the R.A.F. needed urgently.

The organisation rule remains valid—that an objective must be known, and stated, to permit of the detailed plans being made, without which quantity production cannot be realised. The requirements of all the essential functions of an enterprise need to be reconciled, each with the others.

Examples could be quoted of failures in business due to the overruling by one management function of the technical requirements of other functions, particularly when finance is allowed to rule. Finance is not organisationally a separate function, except perhaps in Government. A financial decision is usually the joint decision of the primary functions, representing the considered and balanced judgment of all members of the Board, of whom one is responsible for presenting the accounting view, just as others voice the views of distribution, production, and general management. Where a chairman, with predominatingly financial interests, overrules the reasonable demands for expenditure or product research or process research, he has been known to ruin the company's future at the same time as dividends were increased for a year or two, before they dried up permanently. Cases may also be remembered where the egotism of one man, the chairman with a majority share-

holding, was responsible for a one-sided policy, favouring one function, resultant also in the killing of what was formerly a prosperous business, that might well have remained prosperous under good management.

Equally, too much money can be spent on systems and unnecessary or uneconomic mechanisations, or even on excessive services to staff or customers, with the result that the other functions are starved of essentials. Examples will be recalled of enterprises, and whole trades, that went in heavily for "business buying," gift coupons and wasteful advertising; or of manufacturers who locked up too much capital through buying up shops, or of shopkeepers who bought manufacturers, in attempts to secure an advantage over competitors. Where these policies, justifiable in some cases, went wrong, it was usually clear that too much attention had been concentrated upon one function, to the neglect of others.

Every successful executive knows the importance of co-ordination, some even claim that organisation consists solely of co-ordination. *The work of co-ordination is to reconcile conflicting views with the main purpose, to integrate decisions, not permitting one interest to overrule the others, to harmonise all the activities of the enterprise.* The examples given of rule by one function are perhaps examples of working to the wrong objective, or an unbalanced objective, rather than of the substitution of subjective for objective criteria—a failing that is more usually attributed to political parties and government. It is easy to blame Public Administration for absence of planning, but the day has gone, if it ever existed, when this country was economically and socially independent of all others. The planning of economic development is bound up with the international variables of finance, food, imports and exports, but, far worse, it is affected by non-logical Foreign Policies and National Relations, external forces that are the manifestations of subjective criteria or nationally acquisitive, objective criteria. A planned national economy should demand the determination of objectives to give continuity of operation, to permit of planning, the development or improvement of standards of life and efficiency (subject always to organised criticism); a major problem of organisation would remain: that of forecasting international variables, their measurement

or the making of an estimate to harmonise their needs with the internal requirements or activities of the nation.

The further a country goes towards a truly democratic or managed economy, the more does success depend upon long-term planning and the employment of objective criteria, the elimination of " looking into it," of guessing, or " intelligent estimates," wherever careful forecasts and plans can be substituted. *Scientific government is needed, although for international, political, economic, and administrative reasons it will be infinitely difficult to obtain, as a substitute for rule by expediency and political uncertainty.* Unnecessary absence of definite policies results in much time being given to trying to put things right that never needed to have gone wrong, had the engineering criteria of thinking and planning been observed before action started.

Politics seem to have recently embarked upon a fundamental change. Instead of three, there are two interests, those of the employer or owner, and the other of the employed or tenant. The days of a political party without a policy seem to be passing. Vague generalisations or promises, resulting in opportunism, extemporisation, improvisation, cannot compete with the practical approach needed to maintain our economic civilisation. Yet the two political interests mentioned are not separate interests but are fundamentally the same, so that the change, referred to as fundamental, must equally be classed as temporary, until such time as both interests realise the folly of pulling in opposite directions and insist upon serving their joint advantage by collective planning and the use of objective criteria, scientifically determined.

It is illogical to blame the Executive for all the muddles with which it is concerned, because many of them arise from parliamentary indecision and unforeseeable change. Yet in a managed economy, if that should ever materialise, the whole state must be reasonably efficient. Parliament, through the Cabinet, will need to develop a policy that is capable of being translated by the Executive into plans that will guide and balance employment and production. The blame for absence of objective criteria must be laid upon the fountain head itself —the Cabinet and Parliament, just as it would be attached to the Board of Directors in the case of industrial mismanagement.

If there is not true co-ordination at the top, there will be great inefficiency at most lower levels.

A history of Constitutional Government shows that in the past Democratic Administration has consistently followed a fundamental policy of respect for the liberty of the individual. As a direct consequence of this conception of duty, governments have restricted the exercise of administrative controls to permit the minimum of interference consistent with Defence, the maintenance of Law and Order and the safeguard or development of trade. Willoughby, writing of the principles of Public Administration, goes further and states that comparatively little emphasis has been laid, in the past, upon the problem of bringing into existence an efficient system of government from the modern viewpoint, since it was the expectation that the government would in fact have but few positive duties to perform.

The present tendency is towards a considerable extension of the sphere of government as our economic and our social life are adapted to interconnect with large-scale production, cheap and rapid communication and the gradual realisation of a need for wider Social Services. The period is one of the development of new conceptions of state responsibility to the general welfare and, in consequence, of a greatly increased importance to be attributed to the positive, administrative, and executive functions of government. The more difficult problems of the immediate future may well be concerned less with deciding what has to be done, more with discovering and employing really effective means for the translation of policies and plans into performances. If this is correct the emphasis will move away from duties that are purely administrative, quasi-judicial, towards the positive, executive, or management functions. Administration in this sense is primarily the process, and the agency, used to establish the object or purpose that an enterprise and its staff are to achieve : in its secondary or executive sense it has to plan and stabilise the broad lines, policies or principles which will govern action. Such national and governing policies can only be effective if they employ objective criteria.

3. That the Best Use is not Made of Specialists nor are their Services Well Co-ordinated,

This criticism may be fair, however much specialists, somewhat naturally, stand to be interested in the better use of their own services. For the purpose of considering the case for the plaintiff both major groups of specialists have to be examined.

1. *The technical specialist,* technical of a branch of knowledge, or of a science.
2. *The functional specialist,* the production manager, the engineer, the design and marketing man, the accountant.

In Chapter I it was stated that executive work is primarily concerned with the co-ordination of specialist activities. Chapters III to V have been concerned with a study of how to specialise, because in part the difficulties of co-ordinating specialist activities may be unnecessary and arise from bad organisation that itself results in " difficult " specialists. The impartial specialist, who is neither secretive, nor unduly an individualist, whose specialisation is correctly placed in the organisation, may of himself raise no technical problem for administration.

Perhaps the first principle for consideration is one of organisation, that wherever any specialisation is involved, the subject, or specialism needs to be represented and co-ordinated not only at the " operator " level, but also at the " appeal " level. If the specialism is genuinely technical, has nothing artificial about it, to do with the " expert " and his ingenuity," it must not arbitrarily be overruled by an intermediate executive decision, half-way up the line of authority. If a technical subject is of sufficient importance to be represented at all, it must be represented, either executively or consultatively, at the level of the head of the enterprise, or of the function. The administrative head himself is assumed to be non-technical, or out of touch with developing techniques by reason of the broad and more distant nature of his duties, but he needs to arrange or organise consultation or arbitration to ensure that any specialised aspects of his problems have been fully considered at the operative and the consultative, or appeal level. Such work is most successful when it concentrates upon integrating contra-

dictory technical opinion, instead of employing the method of compromise, which usually means that one or both sides to the conflict have to give up some part of what is considered technically necessary by each of them. The three known ways of dealing with a conflict of technical opinion are : (i) by domination on the part of the chairman, or of an important interest; (ii) by compromise and (iii) by integration. Integration, in the sense in which it is here used, means the adaptation of other circumstances of the problem, or, if necessary, of the policy itself, in order to maintain intact the requirements technically essential to the complete success of the plan. Follett says that integration involves invention, or so turning or altering the circumstances of the problem as to permit of the reconciliation of technical requirements one with the other, that the clever thing is to recognise this and not to let one's thinking stay within the boundaries of two alternatives which are mutually exclusive.

The co-ordination of technical and functional activities and the restoration of formal authority, where specialisation may have weakened it, depend in whole or in part upon the interrelation of each activity with its parent primary function at the operational level ; these functions have already been described (on page 4) as :

Primary Functions.	*Secondaries.*
1. General management;	finance, controls, overall efficiency, etc.
2. Supply;	material research, etc.
3. Production;	design, wages, efficiency, maintenance, inspection, engineering, etc.
4. Distribution;	design, marketing, transport, storage, depots, etc.
5. Accounting and recording;	costing, office management, etc.
6. Staff relations.	welfare amenities, publications, training, etc.

Not all of these functions exist as separate activities in all undertakings. In retailing, numbers 3 and 4 merge, in that

the work, or processes, of the retailer are those of storing and selling, without making use of the function of producing, in the sense of adding to the shape or qualities of the product. In considering the need for co-ordination in any particular enterprise it is helpful to rule a large sheet of paper into columns, heading the first six with the primary functions, leaving the seventh and additional columns for the actual allocation of duties and for particular activities needing special treatment. An analysis should next be made of each main division of the undertaking, entering it, irrespective of the existing set-up, into the parent column and where different under the " actual " head also. Thus an office manager will be entered under (5) accounting and recording in addition to whatever function he may be attached to at present; a consumer research division under (4) distribution and its present location, and so on. This analysis of the " theoretical " organisation is needed *not* in order to try and make the " actual " organisation into one that is theoretical, but to find the points where theory and fact disagree, because those are the points where co-ordination will be needed.

No enterprise should be expected to work to a theoretically correct division of duties and of work; human behaviour and human relations will see to it that any ideal organisation structure is soon made real, is adapted to suit the needs or the wishes of the staff; but it will still be necessary to co-ordinate activities with the theoretical pattern, or overlappings, muddles and discords are a foregone conclusion. The perfect organisation structure is then an ideal, necessary as an object, short-lived as a subject, but it is claimed that it has a further value, an essential value to the all-important work of co-ordination. Knowledge of organisation principles has then two uses, direct to co-ordination and indirect to organisation structure, and this may serve as consolation for the organisation man who is encouraged to co-ordinate but discouraged from reorganisation.

If co-ordination is left to the good sense of individual executives, without giving them any routine of meetings or other opportunity for the exchange of figures and facts explaining policy, plans, and performance, any casualty to any one of the team will automatically remove good sense, for a successor cannot be expected to inherit a knowledge of points at which

unknown people should be consulted. In another way any additional load of work of a high priority tends to postpone attention to such a subject as co-ordination, that may sometimes be apparently unnecessary because the worst so seldom happens, that may on occasion be neglected with impunity. If a technique of co-ordination is required, first find the organisational points of potential discord by imposing the theoretical pattern structure upon the actual working structure, co-ordinating differences; next, examine how work and duties are at present divided, and how, if at all, the co-ordination that is represented by the bridges between theoretical and actual structures is at present obtained. The emphasis here is on duties that are divided and separated physically, not on the re-arranging of work.

Where work is artificially divided and the supervision of its parts is separated, it will be successfully co-ordinated by employing as the agent of co-ordination the same means of section as that with which it was cut.

Duties are cut up in three ways : by

(i) Work, by the function, the process.

(ii) Geographically, by place.

(iii) Staff.

or they may be arranged, without necessarily being separated, by

(iv) The order or series of operations.

(v) The quantity (in the case of homogeneity), synthetic units (in the case of heterogeneity) and in other ways.

It is where actual section has taken place that co-ordination is needed; seldom, where the work has not been separated off, but is arranged in a convenient pattern under the same supervision—seldom, under such cases, does co-ordination provide a major problem of organisation. If within the same workshop or office a job or process is laid out and so arranged as to permit of flow work, each operation being placed as near as possible to the point where the preceding operation takes place, and if there remains the same overall supervision, then co-ordination

should be automatic, if the work is balanced. Where work is divided by quantity it is usually independent.

Where one man is the sole administrator, co-ordination should be automatic, in that his brain, if he is a good administrator, sorts out the priorities that are involved in making a decision, reconciles apparent conflicts, and issues a balanced or co-ordinated decision. Just as the small enterprise can learn from studying the large, where problems are so magnified as to permit of their separation and examination, so also, apparently, may the large learn from the small. In some large enterprises, the headquarters of a manufacturing combine and of a bank afford examples, automatic co-ordination has been attempted by bringing directors or executives together to work in the same room. Special precautions were taken to overcome unnecessary noise distractions by means of soft carpets, height of room, distance between desks, muted telephone bells. In each case it has been claimed that the directors concerned develop a sixth sense, of knowledge of what the others are saying and doing; that this development took a little time and some considerable patience, but that, under the new working arrangements, they have most of the advantages of the powers of co-ordination of a single brain, without the disadvantages associated with autocracy. They say that once you get used to the proximity it is no more fatiguing, in fact less so, because they save the time and effort of attending co-ordinating committees. It must be emphasised that mere sharing of a desk, or moving a number of men and their telephones, dictating machines and callers into one small room, would have the opposite effect. Regard for space and noise is essential. Whereas in some enterprises the work of co-ordination receives constant attention, it will be clear that in many cases failure to co-ordinate at both levels, operational and policy levels, is frequent, yet the solutions are simple—to organise for co-ordination.

That the Best Use is not Made of Specialists. If their services are needed, specialists must be correctly organised, in each case under the function to which the specialism belongs. Alternatively, if management should decide, for any or no reason, to organise it elsewhere, the specialised service must be closely co-ordinated with the parent function. Most specialists

are individualist and respond better to personal and informal leadership that to formal relations. When an enterprise employs a number of specialists the personal qualities of the chief executive are of vital importance to their co-operation and therefore to the co-ordination of their activities. (A number of the organisation factors that govern or condition the choice of a particular division of organisation are studied in Chapter II of Part II of the author's " Approach to Management.")

Nor are Their Services Well Co-ordinated. When activities are divided by function all of them must be brought together at the top level so that the same objectives and policy shall govern the thought and action of the whole enterprise, so that plans may be loyally accepted and striven after, not merely by the heads of the business, but all the way down the line of authority. *All specialised services should be co-ordinated within their own primary function and interrelated with other specialised services through the medium of the functional chief*—not by spasmodic inter-specialist friendship. Thus is achieved the principle to co-ordinate by employing the same means of section as that with which the work was originally divided.

Similarly the problems that arise through a geographical division of work must be co-ordinated at the next geographical level, area by region, region by district, district by head-quarters, if confusion is to be avoided.

When it is decided to organise by persons, in terms of staff, co-ordination must be informal and personal. It will depend above all upon good and informal personal relationships, that cannot exist without knowledge one of the other at first hand, and a friendly, sympathetic atmosphere.

In all enterprises two main sorts of relationship exist, the formal and the informal. Formal relationships arise from the allocation of duties in an organisation structure; they may be improved by reallocation of duties, by reorganisation, where that is necessary, or by co-ordination. Informal relationships on the other hand are personal; difficulties are caused by faulty posting of staff, square pegs in round holes, by bad leadership, poor morale, that in itself may arise from a number of causes, separate or in combination. Bad informal relationships seldom respond to co-ordination machinery alone but depend for translation into co-operation and collaboration upon good

leadership at all levels and an implicit trust in the skill and fairness of top direction.

There are a number of principles of co-ordination. First, that its activities should start at the earliest possible moment, if possible at the moment of formation of policy, so as to take advantage of the open-minded stage of thinking and reasoning, the hypothetical stage. If co-ordination is delayed until later, when theories have been formulated and identified in the mind of the thinker, it often happens that a man is unwilling to give up his "pet theory," which develops into a "conviction" that his way is the right way, to which all others should give place and agreement.

Second, that face-to-face discussions should precede the use of memoranda or minutes. This principle ties back to misunderstanding, due to the use of words with specialised meanings. As Locke had it ". . . it is necessary that words excite in the hearer exactly the same idea they stand for in the mind of the speaker," and this happy state is more possible when discussion takes place, and a man may ask another what meaning he attaches to a particular word than when he reads something in cold print or cold type and misreads its meaning. If these face-to-face discussions take place and where those attending are fully aware of the needs of the situation and consequently of the priorities that emerge from a reasonable consideration of the action needed to carry the policy or the plan into effect, then, as Follett pointed out, the law of the situation discovers itself. When such a law is apparent to intelligent and understanding executives and specialists the need for co-ordination disappears in the realisation of co-ordination.

Third, that co-ordination be regarded and organised as a continuous process, whose need is always there, whose machinery must be designed to give continued service and not rely upon the good sense of selected personnel.

Fourth is the principle of integration, already referred to on page 84, that endeavours to combine, in a common policy or plan, all the technical requirements of the situation. It involves invention, or so turning or altering the circumstances as to permit of the reconciliation of technical requirements one with the other, and the clever thing is to recognise this and not

to let one's thinking stay within the boundaries of two alternatives which are mutually exclusive.

Fifth, as has already been stated, it is most necessary that co-ordination should take place not only at the policy level, but also at the operational level. If work is well grouped such two levels of co-ordination may suffice, but it will often be necessary to arrange co-ordination at all levels of authority.

Services are not always well co-ordinated with the primary functions of the enterprise and this is nearly always due to a failure to think out and eradicate problems of organisation. Co-ordination needs to be of the whole (overall policy), of the parts (policies governing the functions), and of technical specialisations, at the operational level and also at the appeal level.

CHAPTER VII

CONCLUSION

UPON what foundations does the subject of management rest, if it has the right to lay claim to being a subject? Is it perhaps in danger of becoming a cult? If it has become a cult, who genuinely was the first high priest? Jack of Newbury, Thomas Blanket, Charles Babbage, Andrew Ure, Frederick Taylor, F. B. Gilbreth, Henri Fayol?

In staff management, and labour management, much that is classed as new is very old indeed—canteens, music at work, uniforms, overalls, safety precautions. Thomas Deloney's, perhaps romanticised, history of John Winchcomb, usually called Jack of Newbury the famous clothier, was apparently published in 1597, edited by James Halliwell and republished in 1859. Some of it is worth quoting:

"Within one roome, being large and long,
There stood two hundred loomes full strong.
Two hundred men, the truth is so,
Wrought in these loomes all in a row.
By every one a prettie boy
Sate making quils with mickle joy;
And in another place hard by,
An hundred women merrily
Were carding hard with joyfull cheere,
Who singing sat with voyces cleere,
And in a chamber close beside,
Two hundred maydens did abide.
In peticoats of stammel red,
And milke white kerchers on their head;
Their smocke sleeves like to winter snow
That on the western mountains flow,
And each sleeve with a silken band
Was featly tied at the hand;
These prettie maids did never lin,
But in that place all day did spin;
And spinning so with voyces meet,
Like nightingales, they sung full sweet.
Then to another room came they,
Where children were in poor array,
And every one sat picking woll,
The finest from the course to cull . . . .

And these, their labours to requite,
Had every one a penny at night,
Beside their meate and drink all day,
Which was to them a wondrous stay. . . .
A dye-house likewise had he then
Wherein he kept full fortie men;
And likewise in his fulling mill,
Full twenty persons kept he still.
Each weeke ten good fat oxen he
Spent in his house for certaintie,
Beside good butter, cheese and fish,
And many an other holesome dish.
He kept a butcher all the yeere,
A brewer eke for ale and beere. . . .
The old man that did see this sight
Was much amaz'd as well he might.
This was a gallant clothier sure,
Whose fame for ever shall endure.

When the old man had seene this great household and familie, then he was brought into the warehouses, some being filled with woll, some with flockes, some with woad and madder, and some with broad cloathes and kersies readie dyed and drest, beside a great number of others, some stretcht on the tenters, some hanging on poles, and a great many more lying wet in other places. . . . All the clothiers in England joyned together, and with one consent complained to the King of their great hindrance sustained for want of traffick into other countries, whereupon they could get no sale for their cloath . . . this sore of necessitie can no way be cured but by concord . . . copies of a letter were sent to all the clothing townes of England . . . there was found of the clothiers, and those they maintained, three score thousand and sixe hundred persons."

Undoubtedly the story of Jack of Newbury has benefited from the telling, for the grand total of his employees as set down in this story, of which extracts only are offered, comes to one thousand and sixty-four, and historians who claim to have investigated the site and the documentation, have some doubts as to the true size of the undertaking. Yet the dye-house and fulling mill, the sheds for tenters and draining, all sound convincing—that production was organised on a large scale and was divided by process, perhaps it was functionalised too. The formation of a trade association, to develop export " traffick,"

and the circularisation of the members, all sound familiar to us, nearly four hundred years later, as does the need for "concord."

Thomas Blanket seems to have got into trouble in the fifteenth century (?) in that he and some friends caused instruments—doubtless looms for the making of cloth—to be set up in their houses in Bristol and had caused weavers and other craftsmen to be hired. They had relied upon the Royal Writ of 1339 that gave a measure of encouragement to home industry, but were found to have infringed subsequent regulation designed to prevent the growth of large establishments.

Charles Babbage, the English originator of the calculating machine, wrote much later, in 1832. Amongst other matters he mentioned the "Tribute" system of wage payment then used in the Cornish tin mines, a system that related the payment for raising and dressing tin ore to the actual value realised when the ore was sold. Gangs of workmen bid at auction for each lot of work which had been marked out and examined; the lowest bidder secured the contract. Babbage wrote that it was desirable that this tribute system should become general because no other mode of payment affords to the workman a measure of success so directly proportioned to the industry, the integrity, and the talents. There does not, therefore, seem to be anything very new about the modern principle of wage incentives although the present applications of these principles may have become more ingenious. The link between Cornish tin and Phœnicia and Carthage suggests that the building of the Pyramids may have employed measurement of management in addition to measurement of architecture.

Perhaps these instances may show that management should not become a cult and may suggest instead that it should represent one application of the principles of Scientific Method, in the particular fields of factories and of office work.

For too many years science has been regarded as a "cold" subject, concerned with things, not with persons—"coldly scientific" was perhaps meant to imply "impartially or detachedly scientific," but, until quite recently, there has not been over-much evidence of the "warmth" of science, in its application to sociological and managerial problems. The

enlargement of the boundaries of science referred to by Sir Richard Gregory in his address (quoted on page 24) will confirm the view that the subject of management, in so far as it is concerned with knowledge, not with exploitation, is within the sphere of science. This short book has made an attempt also to prove to the manager that his technique of management, or most things that are good in it, are based upon scientific method and analytical reasoning, are in fact the application of principles in the field of managing. *Yet management will never be scientific in the sense of the determination of an exact formula that will govern action. Methods of investigation, of planning and controlling will be scientific, but organisation, direction, co-ordination are shot through with the human variables that make them interesting, that will turn a perfectly scientific but unworkable structure into a possibly unscientific but working organisation.*

It is claimed that despite this, science, or knowledge of principles, is essential in order to provide for co-ordination, that phase of administration or of management classed by so many eminent people as being the most important of all the responsibilities of the executive.

Herschel said that "Art is the application of knowledge to a practical end. If the knowledge be merely accumulated experience, the art is empirical; but if it be experience reasoned upon and brought under general principles, it assumes a higher character, and becomes a scientific art. In the progress of mankind from barbarism to civilised life, the arts necessarily precede science . . . the whole tendency of empirical art, is to bury itself in technicalities, and to place its pride in particular short cuts and mysteries known only to adepts; to surprise and astonish by results, but conceal processes. The character of science is the direct contrary. It delights to lay itself open to enquiry and is not satisfied with its conclusions till it can make the road to them broad and beaten."

The danger of applying scientific method to persons lies in the ruthlessness that may and does develop when employees are treated like machines to be driven at the highest economic speed.

The application of the arts has been known to have the

opposite effect, in paternalism or sentiment, which destroys the initiative and weakens character.

The Art of managing is surely to maintain the balance between scientific precision and human artistry. It is submitted, more it is claimed, that to practise this Art, a knowledge of principles is essential.

DEFINITIONS

In any systematic body of knowledge special meanings are assigned to the terms used in its exposition, in order to obtain due understanding of the subject matter. Unless the meaning of the term used is fixed and apprehended, confusion results. Until some official body concerned with Management comes into being, and formulates authoritative definitions, it may be helpful to the understanding of parts of this text to read and note the following short definitions of some terms, failure to understand which is prolific of error.

Policy expresses the broad outline of the course it is hoped to pursue which will govern the detailed actions of all who work to that policy. Policy is then government, or the governing theory, and reappears, but in a modified form, at each level of authority and for each technical function.

Objectives represent the first analyses of " how " policy is to be achieved.

Administration is primarily the process and the agency used to establish the object or purpose which an undertaking and its staff are to achieve; secondarily, Administration has to plan and to stabilise the broad lines or principles which will govern action. These broad lines are in their turn usually called policies.

Management is the process, and the agency, through which the execution of policy is planned and supervised.

Forecasting is the process of estimating or predicting future external conditions or trends based upon consideration of relevant facts or statistics. As a process it is preliminary to, and associated with, planning.

A *Plan* of operations is a detailed statement of " how " the given objective may be attained, and the process of " planning " consists of resolving or separating each problem into its elements and of their re-assembly in the form of efficient and related procedures. The *Programme* of work is the plan broken down into time units convenient to operation.

Organisation is the process of dividing work into convenient tasks or duties, of grouping such duties in the form of posts, of delegating authority to each post, and of appointing qualified staff to be responsible that the work is carried out as planned.

To *Command* is to set going, and maintain in operation, the services or other activities defined by planning and established by organisation. The process is the issue of instructions which translate broad policy or objective into detailed practice.

To *Control* is, in the management sense, to ensure that the instructions issued, or the plan of operation, has been carried into effect. The process of control is the measurement of performance by comparison with instruction, or programme, or plan.

Co-ordination is the assembly and harmonising with policy or objective, of work, or interests, which have been separated or divided, in the processes of planning and organisation.

A *Function* in an organisation is any group of activities designed to carry out a major, primary, or fundamental purpose of the organisation.

BIBLIOGRAPHY

ARISTOTLE—LEWES, G. H. "A Biographical History of Philosophy." Vol. I. Knight, 1845.

BACON—NICHOL, J. "Francis Bacon: his life and philosophy." Blackwood, 1901.

BAIN, A. "Inductive Logic." Longmans, 1870.

BAKER, J. C. "Directors and their Functions." Harvard, 1945.

BARNARD, CHESTER. "The Functions of the Executive." Harvard, 1942.

BARNES, R. M. "Work Methods Manual." Wiley, 1944.

BARTLETT, F. C. "Fatigue Following Highly Skilled Work." Royal Society, London. Vol. 131, p. 247. 1943.

BYRD COMMITTEE. "Investigation of Executive Agencies of the Government." U.S. Govt., 1937.

DELONEY, T. (1597), HALLIWELL, J. O. (1859). "The History of John Winchcomb."

DESCARTES, R., LINDSAY, A. D. "Discourse on Method." Dent, 1912.

DEWEY, J. "How we Think." Heath, 1933.

DIMNET, E. "The Art of Thinking." Cape, 1929.

DURKHEIM, E., SIMPSON, G. "The Division of Labour." Macmillan, 1933.

FOLLETT, M. (Ed. METCALF and URWICK). "Dynamic Administration." Management Publications, 1941.

GIDDINGS, F. H. "Societal Variables." *Journal of Social Forces.* March, 1923.

GLOVER and MAZE. "Managerial Control." Ronald Press, 1937.

HALDANE COMMITTEE. "Report of the Machinery of Government Committee." H.M.S.O., 1918.

HARTLEY, SIR HAROLD. "Are You Research-minded?" Private, 1943.

HERSCHEL, J. F. W. "Discourse on Natural Philosophy." Longmans, 1830.

LOCKE, J. "An Essay on the Human Understanding." Routledge.

MACCURDY, J. T. "The Structure of Mode." Cambridge, 1943.

MANNHEIM, K. "Man and Society." Kegan Paul, 1940.

MAYO, G. E. "Human Problems of an Industrial Civilisation." Macmillan, 1933.

MAYO, G. E. "The Social Problems of an Industrial Civilisation." Harvard, 1945.

MILL, J. S. "Logic." Longmans, 1919.

MILWARD, G. E. "An Approach to Management." Macdonald and Evans, 1946.

PFIFFNER, J. M. "Research Methods in Public Administration." Ronald Press, 1940.

PLATO—JOWETT, B. "The Republic." Oxford, 1888.

"President's Committees on Administrative Management." U.S. Govt., 1937.

RITCHIE, A. D. "Scientific Method." Kegan Paul, 1923.

ROETHLISBERGER, F. J. "Management and Morale." Harvard, 1943.
RYLE, J. A. "Science and Ethics." *Nature*, Nov. 24, 1945.
SCHLUTER, W. C. "How to do Research Work." Prentice Hall, 1926.
SCHNEIDER, G. "Theory and History of Bibliography." Columbia, 1934.
SMITH, M. "An Introduction to Industrial Psychology." Cassell, 1943.
SPENS COMMITTEE. "University Education and Business." Cambridge, 1945.
WESTAWAY, F. W. "Scientific Method." Blackie, 1937.
WHEWELL, W. "The Philosophy of Discovery." Cambridge, 1860.
WILLOUGHBY, W. F. "Principles of Public Administration." Brookings I, 1927.
WINCHCOMB, JOHN. "Jack of Newbury." Thomas Deloney, 1597 ed. J. O. Holliwell. Richards, 1859.

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